AMERICAN
DYESTUFF REPORTER

VOLUME 42 May 11, 1953 NUMBER 10

Second of a Series——

CHLORINE-RETENTIVE PROPERTIES OF RAYON FABRICS TREATED WITH THE MELAMINE TYPE OF RAYON FINISH

Part A—Strength Changes in Melamine-Formaldehyde Resin-Finished Rayons

GEORGE SIMS WHAM, JR and PAULINE BEERY MACK*
College of Household Arts and Sciences
Texas State College for Women

INTRODUCTION

THE increasing usefulness and economic importance of thermosetting resins as agents for imparting stabilization and other properties to textile fabrics cannot be minimized. Their application has offered means of improving many fabric characteristics which only a few years ago presented formidable problems to the textile trade. In the rayon field, the use of these resins in inhibiting dimensional change, creasing, yarn slippage, and, in some cases, improving the fastness of dyes to washing, has come to be well established. In addition, a research report by Gagliardi and Nuessle (*3*) has shown that resin-modified rayon fabrics have higher resistance to abrasion at low loads than do untreated fabrics, an observation which these workers ascribe to the higher elastic recovery of the modified fibers.

Some of these finishing agents, however, possess one peculiar characteristic which has been a source of difficulty—both during use and laundering—namely, that of retaining chlorine from hypochlorite bleaches in the laundry process. The probable formation of N-chloro compounds, as suggested by Chenicek (*2*), may cause oxidation and subsequent degradation in the cellulose of rayons as well as cottons and linens. Moreover, hydrochloric and other chlorine acids formed in the reaction series may add to the fabric and dye damage attendant upon the retention of chlorine by the laundered fabrics.

This is the second in a series of reports on chlorine retention by textile finishes, sponsored by the American Viscose Corporation through a fellowship conducted at the Ellen H Richards Institute, School of Chemistry and Physics, The Pennsylvania State College, and currently of the Texas State College for Women.

It has been demonstrated by Atkinson and Sargent (*1*) on a quantitative basis that fabrics treated with aminoplasts are amenable to chlorine pickup. By immersing fabrics treated with a methylol-melamine resin in a solution of Clorox (electrolytic sodium hypochlorite) in distilled water as described by these authors, chlorine retention was demonstrated, and a method for its quantitative measurement was proposed.

Resin-treated fabrics may be exposed to hypochlorite bleaches during home and commercial laundering, with serious later outcomes. Cotton and rayon synthetic resin-treated fabrics exhibiting damage, both to strength and to color, have been sent to our laboratories following laundering and use. The first step, therefore, in developing a test for chlorine retention of finished fabrics should involve a study of the properties related to chlorine retention in textiles given actual laundry treatments under practical conditions.

Such studies have been initiated on a preliminary basis by Wachter, Davison, and Knight (*5*), who also have carried out the first steps in the evaluation of an accelerated chlorine test designed to show qualitatively whether strength damage would be incurred in certain textile finishes by chlorine pickup. These authors found that strength losses incurred by a low-temperature commercial laundry procedure, involving the use of a low chlorine concentration in one step of the procedure, caused strength losses of a low order of magnitude in comparison with practical observations which they had made. Pressing at the temperature of a hand iron set for rayons did not increase the losses. Exposure to light in a Fade-Ometer following a series of launderings greatly enhanced the fabric strength damage. They suggested a continuation of this study, which was limited in scope.

TABLE I

Fabric	Yarns per Inch: Warp	Yarns per Inch: Filling	Type of Fiber
I. Striped Melamine (M) Finished Fabric	138	75	Viscose
I. Striped Fabric, Control (C)	138	75	Viscose
II. Checked Melamine (M) Finished Fabric	138	75	Viscose
II. Checked Fabric, Control (C)	138	75	Viscose

* The investigation upon which this report is based was conducted in major part while Dr Mack was director and Dr Wham a research faculty member of the Ellen H Richards Institute, School of Chemistry and Physics, The Pennsylvania State College, and concluded after both joined the faculty of the Texas State College for Women.

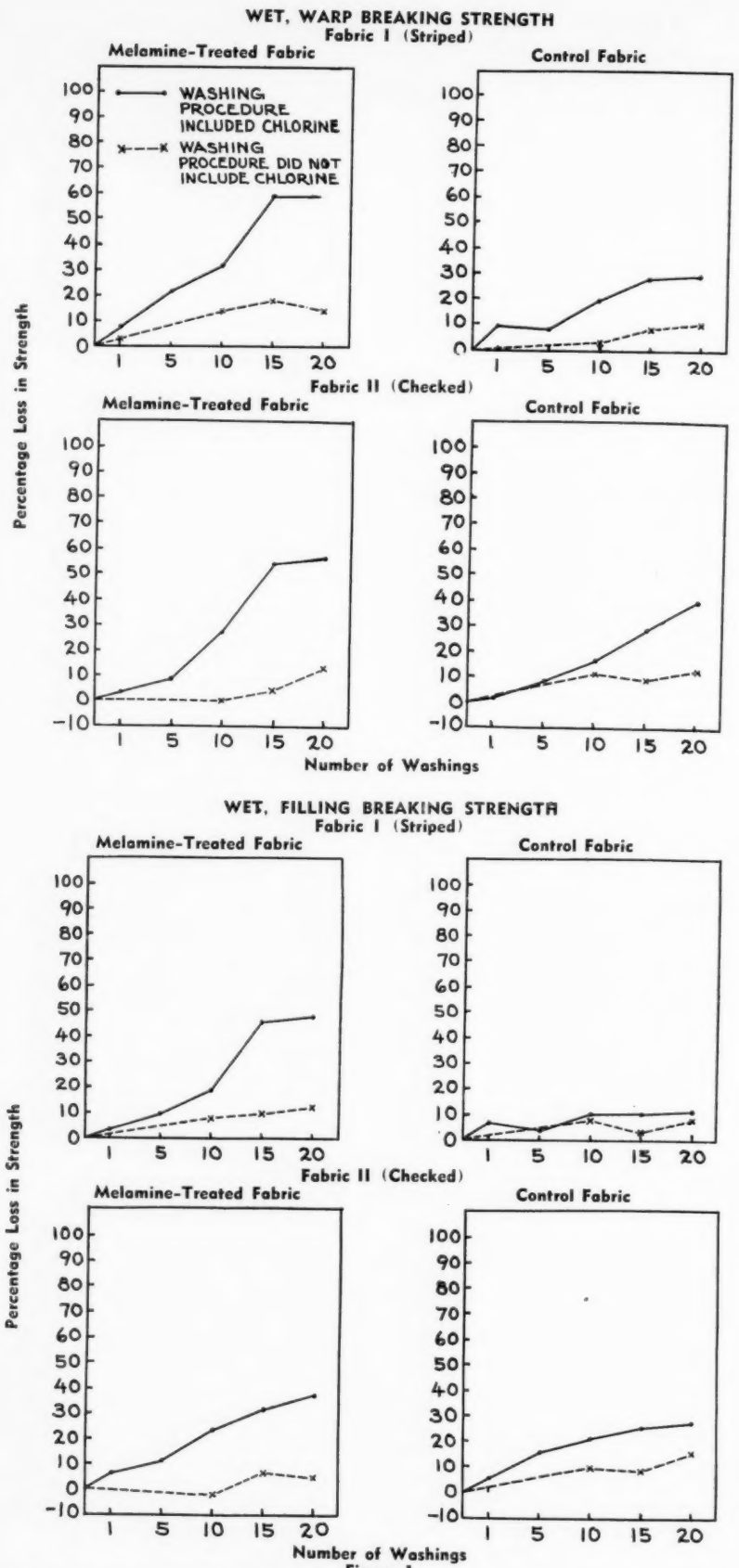


Figure 1

Comparison of Wet Breaking Strength Changes in Experimental Fabrics Laundered According to Identical Formulas, Except for the Presence or Absence of Chlorine in the Fourth Step of the Process

The present study involves the use of two melamine-formaldehyde resin-finished viscose rayon fabrics and two control fabrics, identical in every way except for the fact that no special additive finish was applied to them. The laundry procedure employed was a commercial method which involved a higher maximum temperature than that used by the former investigators, with chlorine of similarly low concentration (following the best known practices) added on the last suds bath of a nine-step operation.

Pressing on a steam-heated flatwork ironer at a relatively low temperature was employed in certain steps of this procedure; and Fade-Ometer exposure was interspersed with laundering, whereas in the former study it merely was applied after a series of laundry treatments.

Certain strength tests were made for comparative purposes after laundering by a procedure which was identical with that mentioned above, execpt for the omission of sodium hypochlorite.

PLAN OF PROCEDURE

FABRICS——The experimental textiles of this study were two plain-weave viscose rayon fabrics treated with a melamine-formaldehyde resin finish and two identical fabrics without a special additive finish. The fabrics had the initial characteristics shown in Table I.

LAUNDRY PROCEDURE——Test and control specimens for the power laundry trials were prepared and laundered together 20 consecutive times in a 40″x37″ commercial washwheel. The method used was a standard wash procedure recommended by Sherrill (*4*) for cotton and severely stained rayon loads, in which a small, controlled concentration of chlorine is used under optimum pH conditions for strength preservation. An outline of the procedure follows:

	Time (minutes)	*Temperature (°F)*	*Reagents*
		SUDS BATHS	
1)	5	95	0.1% sodium oleate flakes and 0.04% sodium carbonate, zeolite-softened water
2)	10	140	Same
3)	20	160	Same
4)	10	160	Same plus 0.01% available chlorine
		RINSES	
5)	3	160	Zeolite-softened water
6)	3	160	Zeolite-softened water
7)	3	130	Zeolite-softened water
8)	3	120	Zeolite-softened water
9)	3	95	Zeolite-softened water

Since many commercial laundries do not use antichlors, and since preliminary investigations by Davison and Wachter (*5*) had shown that sour would react unfavorably with chlorine if any should be retained in the fabric, no antichlor bath or souring operation was included in the laundering procedure. Furthermore, since the control and test specimens were included in the same wash load, it seemed justifiable to assume that, if chlorine remained in the fabric solely because of the failure to use an antichlor, any detrimental effect that it might have would show both on the test pieces and the control fabrics.

The launderings were repeated without the added chlorine for some of the tests, as mentioned.

Four sets of samples from each resin-treated fabric and each control fabric were washed together in the laundry and auxiliary trials, as follows.

TREATMENT OF FABRICS——Sets of test specimens numbered I, II, III, and IV, were subjected to various physical treatments as follows:

Set I—Laundered only.

Set II—Laundered and exposed for 40 hours in an FDAR Fade-Ometer after 1, 5, 10, 15, and 20 launderings, making a total of 200 Fade Ometer exposure hours.

Set III—Laundered and pressed after each laundering on a padded one-roll ironer with the steam pressure maintained at 32 pounds, temperature 275°F.

Set IV—Laundered, pressed after each laundering, and exposed for 40 hours in a Fade-Ometer after 1, 5, 10, 15, and 20 launderings, making a total of 200 Fade-Ometer exposure hours.

Samples of the experimental fabrics were withdrawn after 1, 5, 10, 15, and 20 launderings for test purposes.

STRENGTH TESTS——The tests on the fabrics included *breaking strength* warpwise and fillingwise (dry and wet), made by the standard ravel-strip method under standard conditions of 70°F and 65 per cent relative humidity, with strength loss calculations based on the strength per thread; and *bursting strength* (dry and wet) made by the use of the Mullen motor-driven tester, also under standard conditions.

One series of the two melamine-formaldehyde resin-finished and the two nonresin-treated fabrics were washed 10 times, using the laundry formula, which included chlorine in the one step as described, and then were exposed for certain periods of time during the spring, in the inside of windows with a southwest exposure. Simultaneously, a series was exposed without the preliminary washings. Specimens of both groups were removed for test purposes after one week, and one, two, three, and four months.

In the study by Wachter, Davison, and Knight (5), it was learned that test specimens must be kept in darkness between applying the test and making the breaking strength evaluations, and that the time lapse between the two must be as short as possible. These findings were taken into consideration throughout this study.

PHOTOMICROGRAPHS —— Photomicrographs were taken of representative fibers from the melamine-formaldehyde resin-finished and the control fabrics after 20 launderings by the chlorine-containing process, including pressing, and a total of 200 hours of Fade-Ometer exposure. The photomicrographs were taken with a Spencer phase microscope, using an 8 mm objective, 12.5 X ocular (240 X) with the B lens in the condenser and with a dry mount. Fiber damage was rendered more visible by staining the specimens with a 2.0 per cent solution of methylene blue. To insure the choice of representative fibers for photographing, numerous slides from different areas of the samples were prepared. These slides were carefully scrutinized by the authors who agreed that the fields photographed were representative of the fabric specimen as a whole.

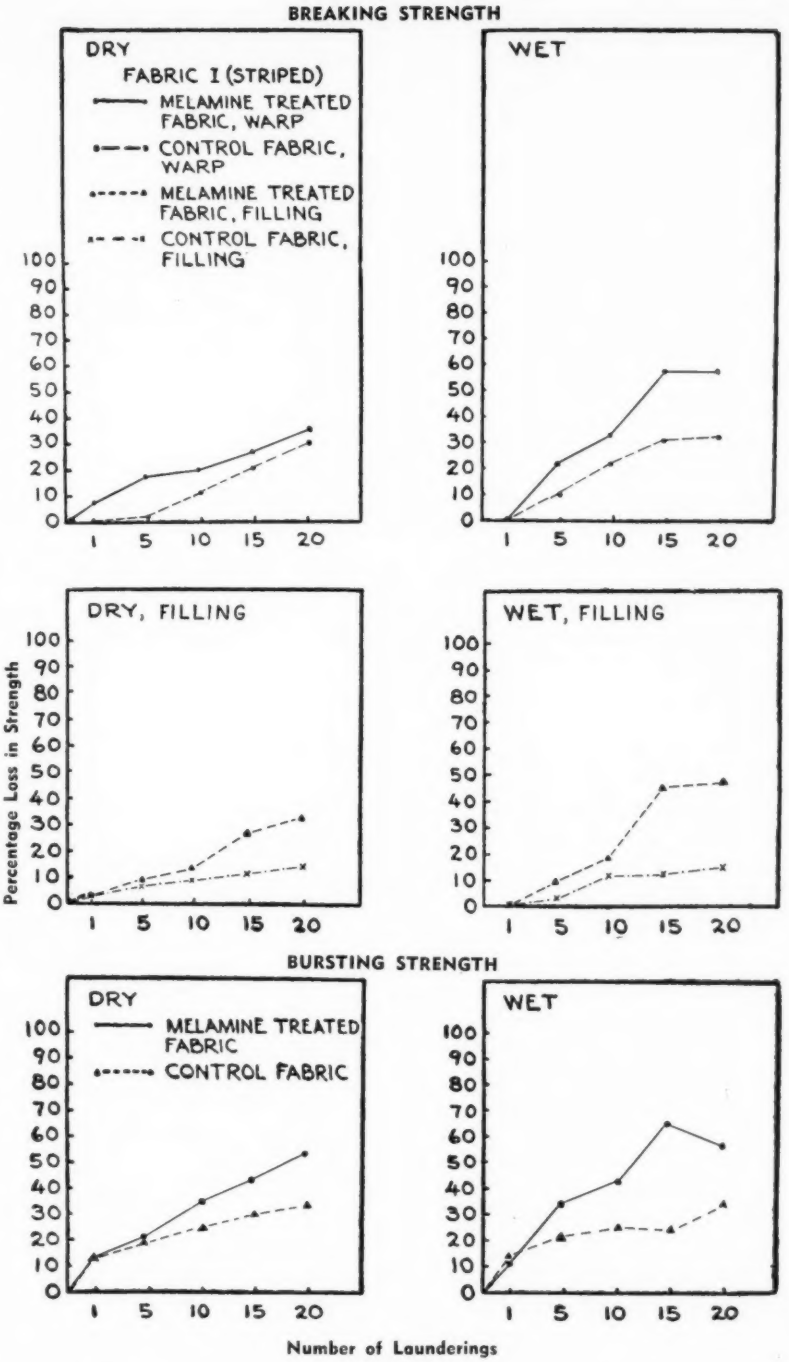


Figure 2
Strength Losses of Melamine-Formaldehyde Resin-Treated Fabric I and Its Corresponding Control after Repeated Washings with a Commercial Laundry Procedure including Chlorine in One Step of the Process

FINDINGS AND DISCUSSION

Comparison of Laundering With and Without Chlorine in the Washing Formula——Figure 1 gives a comparison of the wet-breaking-strength losses in the experimental fabrics laundered by the commercial washing procedure in which 0.01 per cent available chlorine was used in the fourth step, as well as those laundered by the identical procedure except that the chlorine was omitted from this step.

The figure shows that both the melamine-formaldehyde-treated fabrics and the fabrics without resin finish in both of the sets of experimental fabrics suffered greater wet warp and filling breaking-strength losses when chlorine was used in the laundry procedure than when it was omitted. The losses were greater with repeated washings in the melamine resin-finished fabrics than in the controls. Whereas the rise in strength losses generally was gradual through the first few washes, they then tended to experience a sharp rise. At 20 washings the difference between the losses in the procedures which included and which did not include chlorine were far greater in the resin-treated than in the control fabrics.

In the laundry procedures in which no chlorine was used, the wet breaking strength losses were comparatively low throughout, and were similar for the resin-treated and the fabrics without resin finish.

Comparison of Strength Losses in the Melamine - Formaldehyde Resin - Finished and in the Control Fabrics During Laundering by a Process Which Included Chlorine. Figures 2 and 3 include line graphs, respectively, showing the breaking- and bursting-strength losses, dry and wet, of the two fabrics and their corresponding controls, when the fabrics were given a series of commercial launderings with 0.01 per cent of chlorine included in the fourth step.

Fabric I, melamine finished, showed but small differences from the control of Fabric I in dry, warp breaking strength through the 20-wash series; but the melamine-resin-finished Fabric I showed greater wet, warp breaking-strength losses than did the control, throughout the entire 20 laundry repetitions (see Figure 2). In dry, filling breaking-strength losses, the resin-treated Fabric I showed greater losses after the first washing than did the control of this fabric. The spread became wider between the two fabrics with repeated washings. The spread between the wet, filling breaking-strength values was greater than that of the dry, filling values, with the resin-finished fabrics showing greater losses throughout.

Dry bursting-strength values in melamineformaldehyde resin-finished Fabric I were greater than those in control Fabric I, the spread becoming greater with a progressively greater number of washings. The spread between the resin-treated- and the corresponding control fabrics generally was greater in the wet- than in the dry-brusting-strength losses.

Figure 3 shows comparable data on

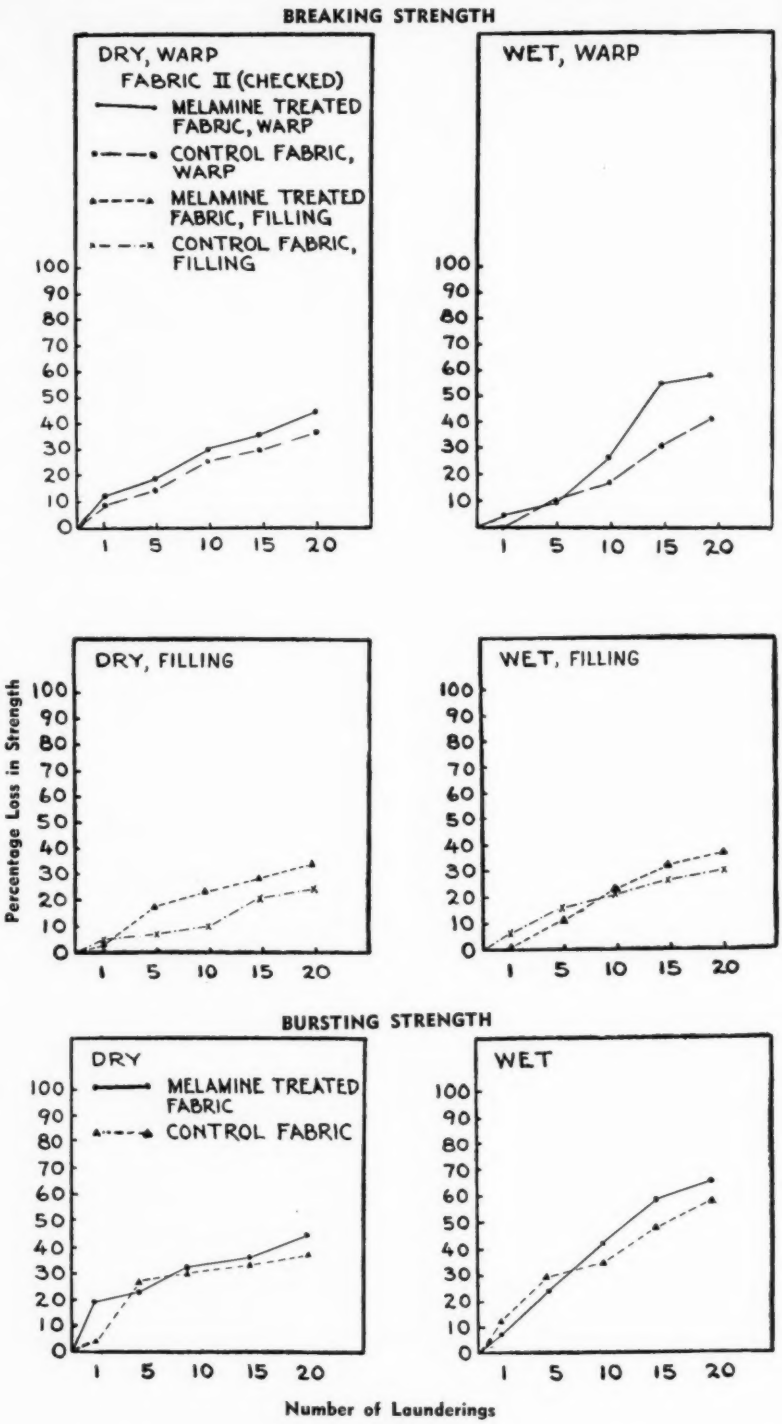


Figure 3
Strength Losses of Melamine-Formaldehyde Resin-Treated Fabric II and Its Corresponding Control After Repeated Washings with a Commercial Laundry Procedure Including Chlorine in One Step of the Process

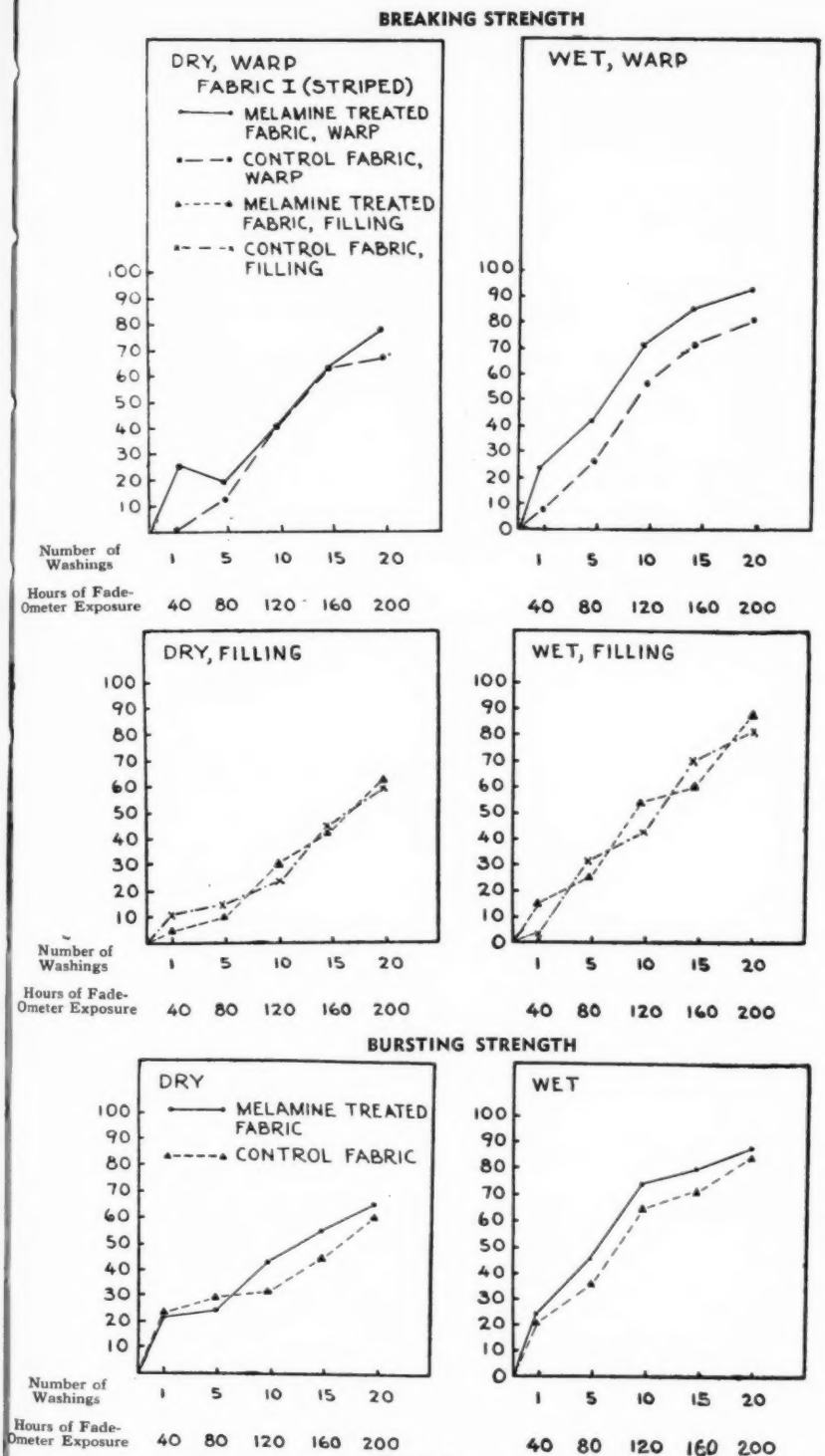


Figure 4
Strength Losses of Melamine-Formaldehyde Resin-Treated Fabric I and Its Corresponding Control after Repeated Washings with a Commercial Procedure including Chlorine in One Step of the Process Alternated with Light Exposure in a Fade-Ometer as Described in the Text

strength losses during laundering (with chlorine used in the laundry procedure) for melamine-treated Fabric II and its corresponding control fabric. In this case also the spread between these paired fabrics was not great, although the losses were consistently greater in the former after the early washes.

Comparison of Strength Losses in the Melamine-Formaldehyde Resin-Finished Fabrics and in the Control Fabrics during Laundering with and without Light Exposure——Figures 4 and 5 show by line graphs the breaking and bursting-strength losses of the two experimental resin-treated fabrics and their corresponding controls after laundering with the chlorine-containing formula and alternate exposure in a Fade-Ometer, as described.

The combination of light and laundering tended to produce higher strength losses in the fabrics than did washing alone. In Fabric I, laundering by the chlorine-included procedure, alternated with light exposure in a Fade-Ometer, produced high dry-warp breaking-strength losses in the resin-finished fabric, with but slightly lesser losses in the control. In the wet condition, the warp breaking-strength losses were higher, with a greater spread between the resin-treated and the control fabric.

The dry, fillingwise breaking-strength losses in melamine-finished Fabric I were not so high as the warp, and were similar to those in control Fabric I. In the wet, filling losses, the resin-finished and the control specimens were similar throughout.

The two fabrics of the Fabric I pair resembled each other in dry bursting-strength values through the first five washings, and the accompanying light treatments. At the higher numbers of washings, however, the resin-treated fabric showed somewhat higher losses than did the control. In wet bursting-strength, the resin-treated fabrics gave slightly higher losses throughout all of the laundry-light treatments of this series.

Fabric II, resin-finished, gave slightly lower strength losses in the early washings and light treatments than did the control, with losses of the two similar at five washings, and losses of the resin-treated somewhat higher thereafter. In wet, warpwise breaking strength, however, losses in the melamine resin-treated Fabric II distinctly surpassed its control after five launderings.

Losses in dry, fillingwise breaking strength were similar for the resin-treated and the control of Fabric II. The wet, filling strength losses showed higher values for one at one washing interval, and for another at another, throughout.

In dry bursting strength losses, resin-treated Fabric II surpassed the control beginning with the tenth washing, and accompanying light treatment. The wet-bursting-strength losses of resin-treated Fabric II exceeded those of the corresponding control also beginning with the tenth washing and concurrent light exposure hours.

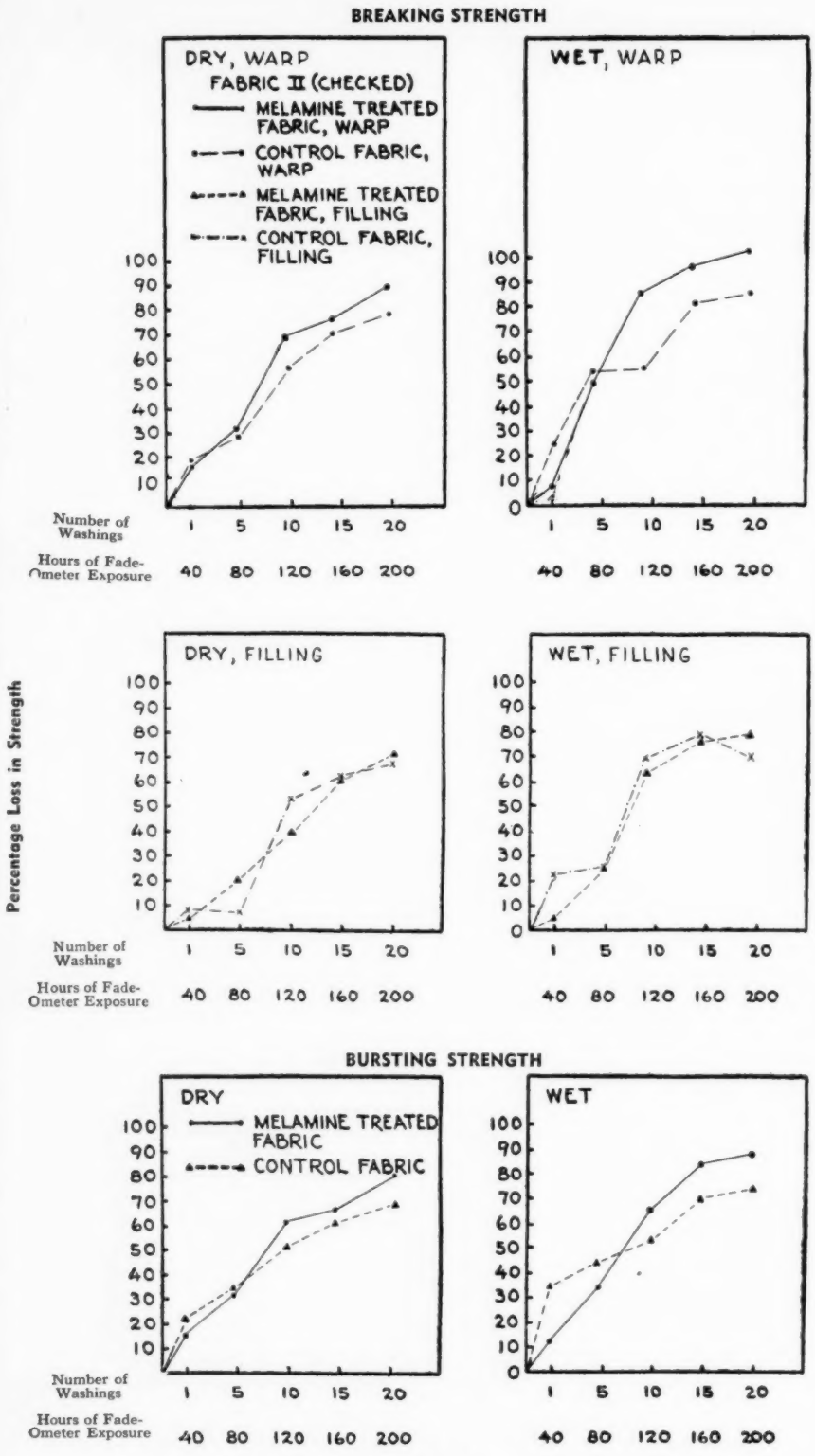


Figure 5
Strength Losses of Melamine-Formaldehyde Resin-Treated Fabric II and Its Corresponding Control after Repeated Washings with a Commercial Procedure including Chlorine in One Step of the Process, Alternated with Light Exposure in a Fade-Ometer as Described in the Text

Figures 6 and 7 show by bar graphs a comparison of the effects upon breaking strength, dry and wet, of laundering the test specimens by means of a washing formula involving, in one step of the procedure, 0.01 per cent of available chlorine. The following comparisons are shown in the graph: (a) laundering only; (b) laundering and light exposure (in a Fade-Ometer); (c) laundering and pressing; and (d) laundering, pressing, and light exposure.

Comparison of Strength Losses in the Melamine-Formaldehyde Resin-Finished Fabrics and the Control Fabrics During Laundering with and without Pressing—— In dry and wet breaking strength, warpwise and fillingwise, pressing caused but little difference in strength change in the test fabrics which were laundered and pressed, in comparison with those which were laundered but not pressed (Figures 6 and 7). This was true both in the melamine resin-finished and in the control fabrics which had not been given a resin finish. It should be noted, however, that the temperature of pressing was low (275°F). Yellowing or browning of white areas in the fabrics, however, was found in the melamine resin-treated fabrics, becoming progressively greater as the number of launderings and pressings increased. Similar discolorations were not found in the control fabrics which did not have the resin finishes.

The alternate exposure to light in a Fade-Ometer, on the other hand, greatly increased the breaking strength losses, with the losses tending to be greater in the two resin-finished fabrics than in the control fabrics, particularly in the higher number of washings. This indicates that the severe losses observed in laundered fabrics possessing this type of finish which have come into the laboratory of the authors for analysis undoubtedly reflect a combination of damage from chlorine retained by the fabric during the laundry process, augmented by exposure to light.

It is obvious from the above that pressing exerts but small effect upon strength losses in resin-treated fabrics, but that it undoubtedly has considerable influence upon discoloration, particularly of whites. Light, on the other hand, materially reduces the strength both of the resin-treated and the control fabrics, the former tending to be greater than the latter, when light treatment is alternated with laundering by a power laundry procedure involving very small concentrations of chlorine in one step of the process.

Figure 8 shows, by means of bar graphs, the dry- and wet-bursting-strength losses of the two experimental fabrics and their controls caused by laundering (with chlorine in the process) alone, with laundering and light exposure in a Fade-Ometer, with

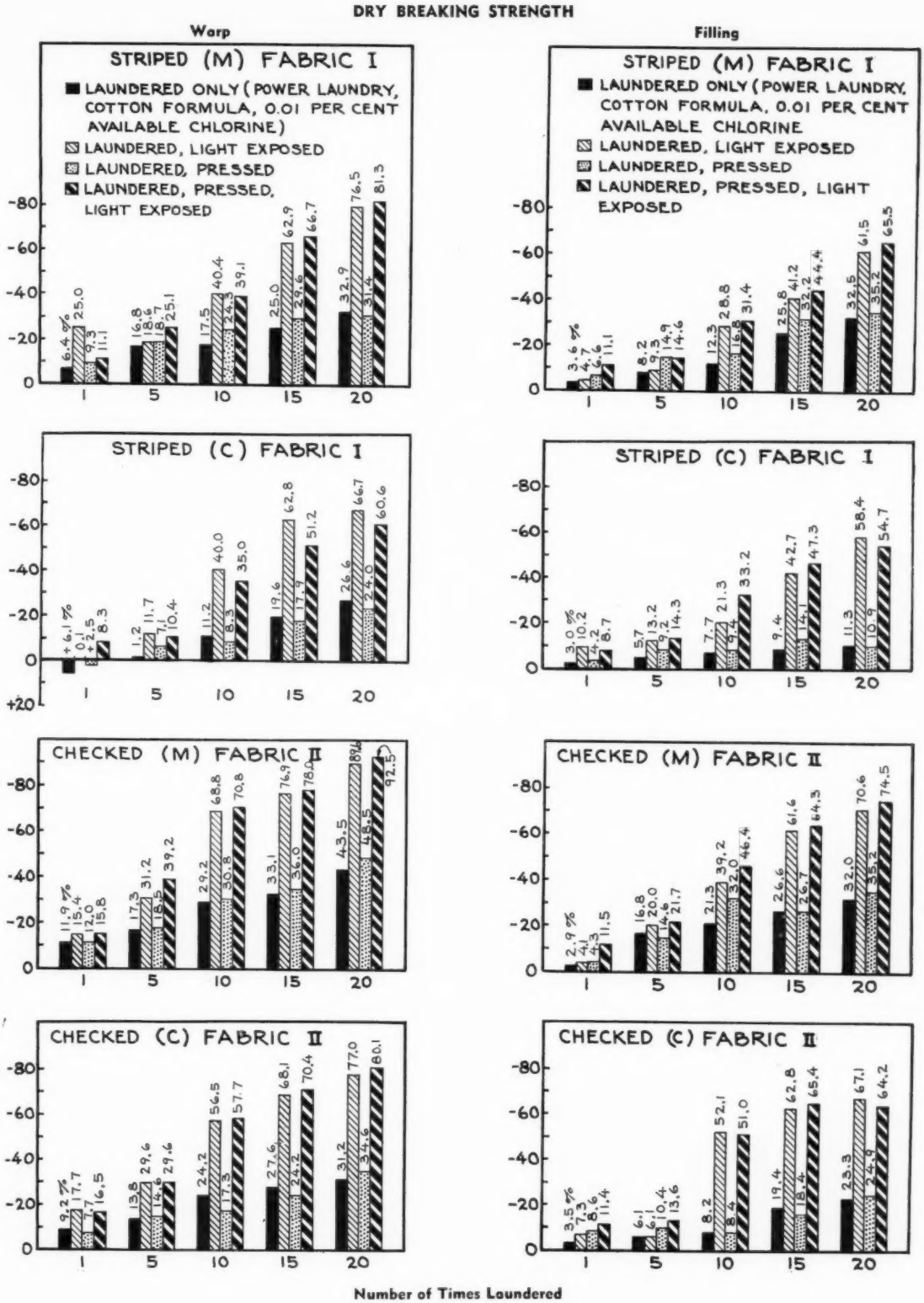


Figure 6

Comparison of Dry Breaking Strength Losses in Fabrics I and II, Melamine Resin-Finished (M) and Corresponding Control (C) Specimens of Each Pair of Fabrics—Striped and Checked—after Commercial Laundering involving Chlorine in One of the Steps; after Laundering and Light Exposures in a Fade-Ometer; after Launderings and Pressings; and after Launderings, Pressings and Light Exposures

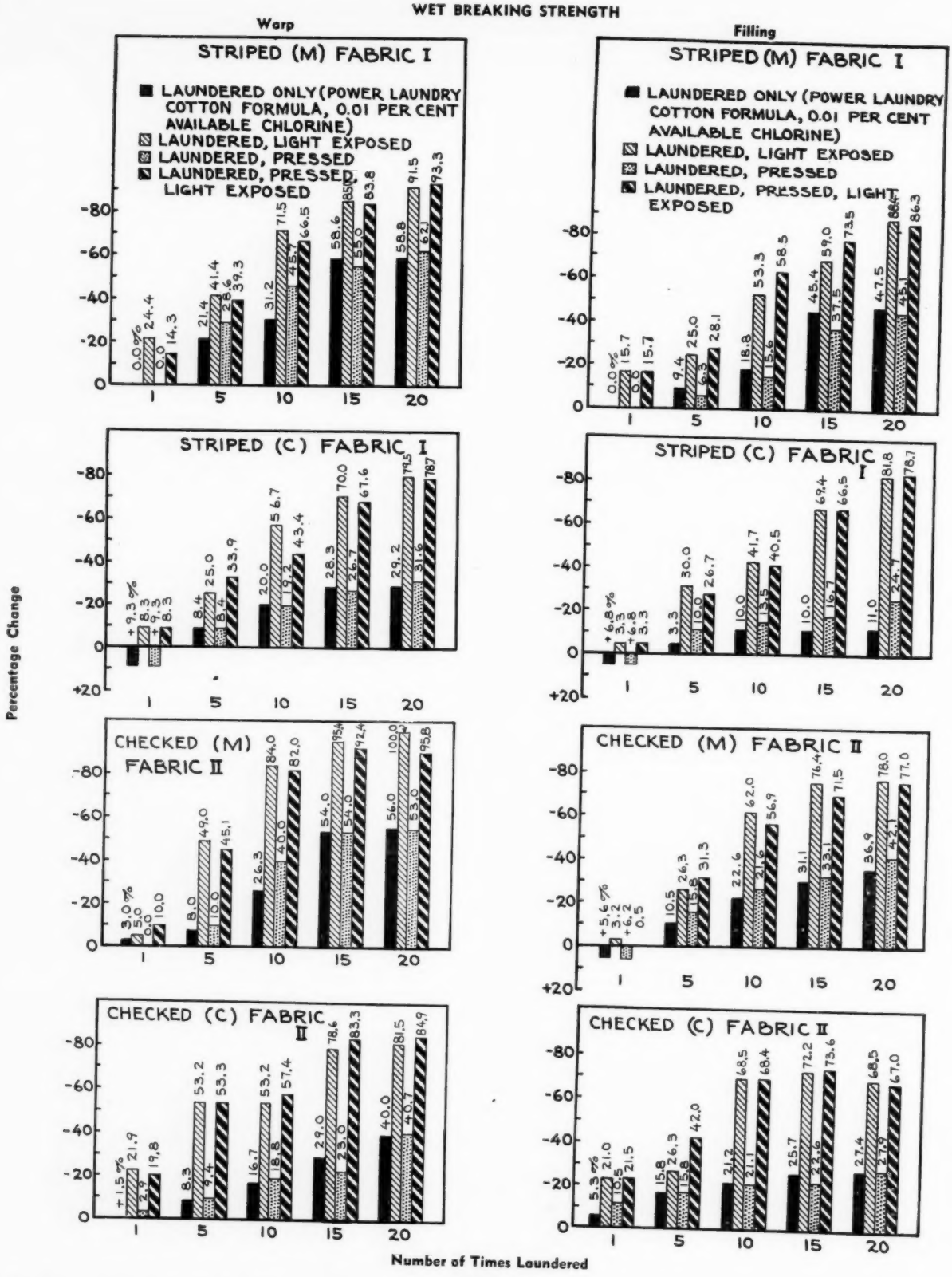


Figure 7

Comparison of Wet Breaking Strength Losses in Fabrics I and II, Melamine Resin-Finished (M) and Corresponding Control (C) Specimens of Each Pair of Fabrics—after Commercial Launderings involving Chlorine in One of the Steps; after Launderings and Light Exposures in a Fade-Ometer; after Launderings and Pressings; and after Launderings, Pressings and Light Exposures

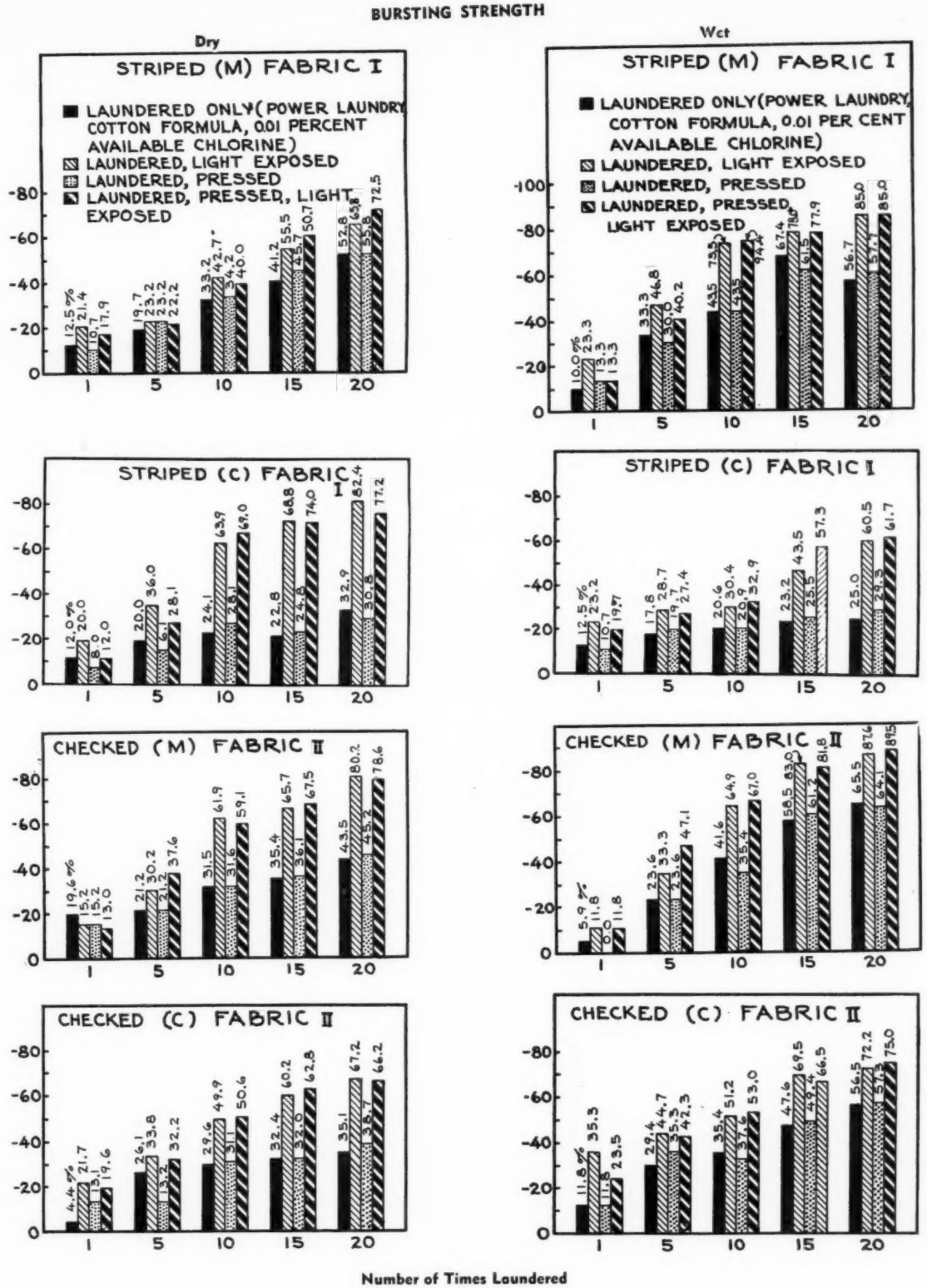


Figure 8

Comparison of Dry and Wet Bursting Strength Losses in Fabrics I and II, Melamine Resin-Finished (M) and Corresponding Control (C) Specimens of Both Parts of Fabrics—after Commercial Launderings involving Chlorine in one of the Steps; after Launderings and Light Exposures in a Fade-Ometer; after Launderings and Pressings; and after Launderings, Pressings and Light Exposures

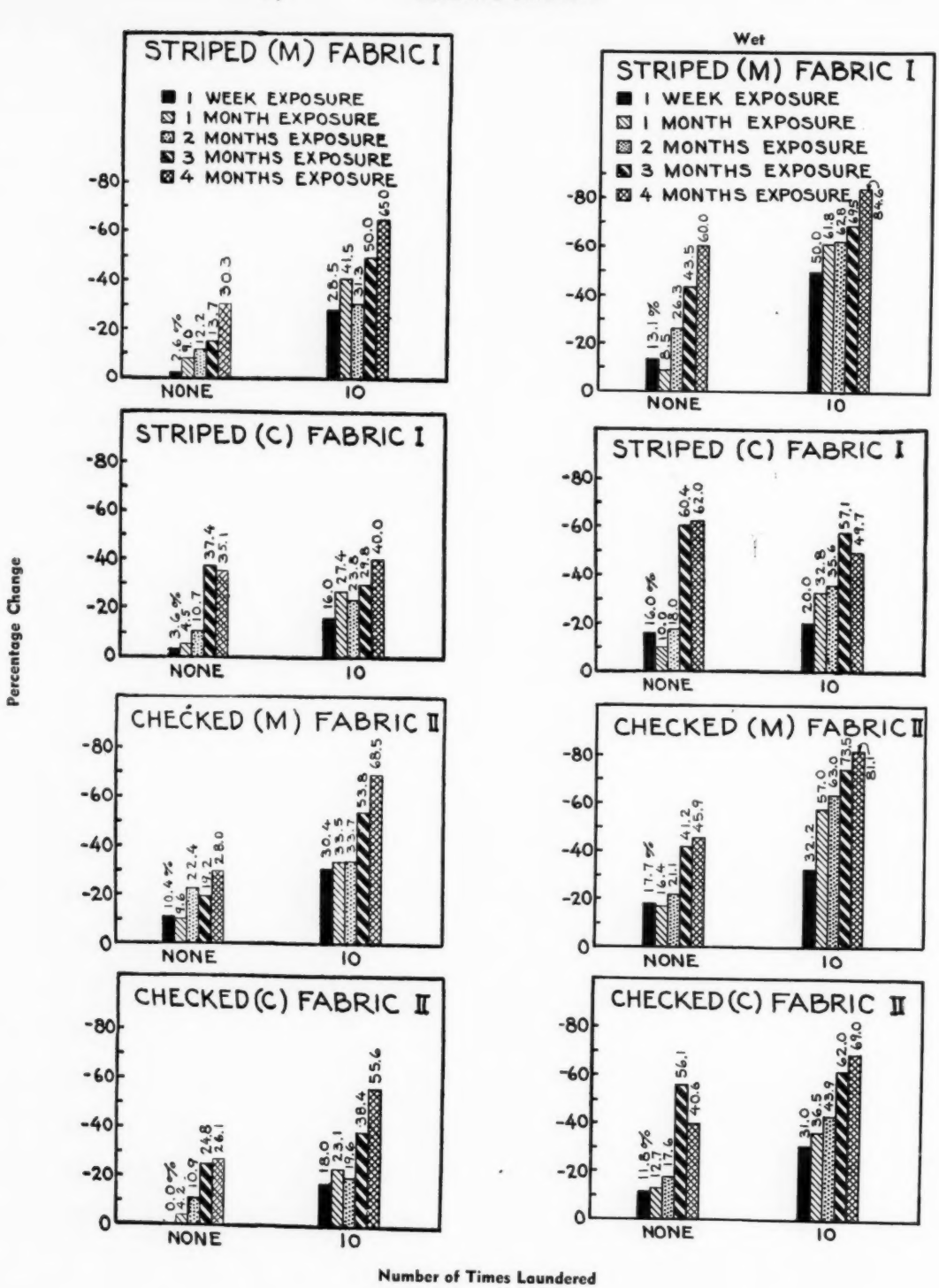


Figure 9

Comparison of Dry and Wet Bursting Strength Losses in Fabrics I and II, Melamine Resin-Finished (M) and Corresponding Control (C) Specimens of Each Pair of Fabrics—Striped and Checked—after 10 Initial Commercial Launderings involving Chlorine in One of the Steps; Followed by Exposures Inside a Window for One Week, One, Two, Three and Four Months in Comparison with One Series Exposed for the Specified Periods of Time without the Preliminary Washings

laundering and pressing, and with laundering, pressing, and exposure in a Fade-Ometer.

The bursting strength changes showed the same general trends as the breaking strength values, with pressing making but small differences in comparison with laundering alone, and with alternate exposure in a Fade-Ometer causing far greater changes than laundering alone, or than laundering and pressing, combined. Again, the melamine formaldehyde resin-treated fabrics tended to show somewhat greater bursting-strength losses than did the comparable control fabric, particularly in the higher numbers of washings.

Comparison of Strength Losses in the Melamine-Formaldehyde Resin-Finished Fabrics and in the Control Fabrics from Exposure Indoor Daylight, with and without Preliminary Laundering by a Procedure Involving Chlorine —— Figure 9 shows the results in terms of bursting strength losses of light exposure through window glass, with and without a preliminary series of 10 successive launderings by the procedure involving chlorine. Breaking strength determinations were not made on this series.

In the fabrics which were not laundered before exposure through window glass, as described, the effect of the exposure is evident in Figure 9. In the fabrics which were laundered 10 times and then exposed, respectively, for one week, one, two, three, and four months in the manner described, decidedly more bursting strength was lost than in the series which was exposed without the preliminary launderings. In these series, the nonlaundered melamine resin-finished and the control fabrics showed little difference for the light exposure alone, whereas the resin-finished fabrics of the two types lost more strength upon exposure through glass following 10 launderings than did those without the resin finish.

Microscopic Appearance of Fibers—— Figure 10 shows two photomicrographs representative of fibers from melamine-formaldehyde resin-finished and from the comparable control fabrics, respectively. Both had been laundered according to a procedure involving chlorine and pressed 20 times, and subjected to intermittent light exposure in a Fade-Ometer, the light exposure totalling 200 hours.

More extensive physical damage was apparent on the fibers from the resin-finished than on those from the untreated fabrics.

240 X

Fibers from Melamine-Formaldehyde Resin-Finished Fabric (8 mm objective, 12.5 ocular, B condenser)

240 X

Fibers from Control Fabric (8 mm objective, 12.5 ocular, B condenser)

Figure 10

Phase Photomicrographs of Viscose Rayon Fibers (Left) Taken from Melamine-Formaldehyde Resin-Finished Fabric and (Right) from Control Fabric Not Resin-Finished. Both Fabrics Had Been Washed and Pressed 20 Times, Following a Commercial Laundry Process Which Involved Chlorine and Had Been Exposed Intermittently in a Fade-Ometer for a Total of 200 Hours.

SUMMARY

Two fabrics were given a melamine-formaldehyde resin-finish in a commercial plant, with other yardages of the same two fabrics given no additive finish. Both fabrics of each pair were finished to the same dimensions.

The two pairs of fabrics were laundered by a nine-step commercial laundry procedure in a commercial laundry washwheel. During one series of washings chlorine was omitted from the laundry procedure, and wet-breaking-strength values were made on these fabrics. During a comparable washing series, chlorine to the extent of 0.01 per cent was used in Step 4 of the laundry process, and the same series of strength tests were run.

Wet-breaking-strength losses tended to be greater in the laundering series in which chlorine was used in the procedure than when it was omitted. The spread between the losses with and without chlorine in the laundry procedure was greater, particularly upon repeated launderings, in the resin-treated than in the corresponding control fabrics.

In other comparative series of tests, laundering with chlorine in one step of the porcedure was carried out alone, combined with low-temperature pressing, and alternated with light exposure in a Fade-Ometer with and without the pressing operation.

Dry- and wet-breaking and bursting strength determinations were made on these series.

Pressing at the selected temperature caused little difference in strength loss, both in the melamine-treated and in the control fabrics of each pair, although yellowing and browning of white areas became progressively greater with repeated launderings and pressings, in comparison with laundering alone. The nonresin-finished comparable control fabrics did not show similar discolorations in the white areas.

Light exposure greatly increased the losses in fabric strength.

The losses throughout tended to be greater for the melamine-formaldehyde-treated fabrics than for the controls, particularly as the washings progressed.

The repeated laboratory tests on laundering covered in this report were made in succession, only with time for air drying allowed between the washings. Therefore, no opportunity for intermediate aging was provided. The series providing alternate exposure in the Fade-Ometer, as described, added the light-aging factor to the tests, and showed the part played by light in the deterioration of melamine resin-treated fabrics and their comparable controls which had come in contact with chlorine during a laundry procedure.

A series of bursting strength tests on fabrics in which light exposures through window glass were made with and without preliminary launderings (including chlorine) demonstrated further the importance of light exposure as a factor in deterioration of resin-treated fabrics through chlorine retention, and showed also a trend toward greater losses in the resin-finished than in the control fabrics.

The work upon which this report is based shows that chlorine in the small, controlled amounts found in the described laundry procedure can be retained by fabrics treated with resins of the melamine-formaldehyde type, with greater strength losses resulting than those found in the same fabrics when chlorine was not used in the washing procedure. Moreover, a definite trend toward greater losses was sustained in the resin-treated fabrics when chlorine was used than appears in the same fabric given an ordinary dress finish. Light was shown to be a factor in these strength losses. Wet strength losses tended to be greater than dry.

ACKNOWLEDGMENTS

The authors are deeply indebted to Frederic Bonnet, Arthur R Wachter, and Ralph Riegner of the American Viscose Corporation, for invaluable help in the procurement of fabrics and in the planning of the studies included in this report.

BIBLIOGRAPHY

(1) Atkinson, Edward R and Sargent, Neil A, "Determination of Chlorine Pick-up," *Am Dyestuff Reptr* 38, 743 (1949).
(2) Chenicek, Albert G, "Active Chlorine Compounds, Their Chemistry and Application," *Textile Research J* 16, 219 (1946)
(3) Gagliardi, D D and Nuessle, A C, "The Relation between Fiber Properties and Apparent Abrasion Resistance", *Am Dyestuff Reptr* 40, 409 (1951).
(4) Sherrill, J C, Private Communication (1949).
(5) Wachter, Arthur H, Davison, Suzanne and Knight, Marian Krape, "Chlorine Retention in Textile Finishes," *Am Dyestuff Reptr* 42 261 (1953).

• PATENT DIGEST •

PAUL WENGRAF

PRINTING VAT DYES——— Fast Brown Shades D, 2, 01

Brit P 671,382
(Imperial Chemical Industries——Chadderton et al——May 7, 1952)

A large number of brown vat dyes are available for printing purposes but most of them are not readily fixed, their being sensitive to variations in steaming conditions; also in connection with their use, tendering of cellulosic fibers upon exposure to light has been observed frequently. One of the most extensively used brown vat dyes of the naphtho-thionaphthene indigo series is known to give redder shades on viscose than on cotton, thereby precluding its use in printing or dyeing mixed materials.

The problem of producing brown prints of good fastness to light and washing with good working properties, wherein the fibers are not tendered and even shades on cotton and viscose are attained, has been solved by using an acylated amino acedianthrene as the dyestuff. The present patent protects the the application of this new compound in printing according to the standard potash-Rongalite method.

The manufacture of dyestuffs of this group is touched upon in Brit P 441,049 (I G Farbenf/1936), with a reference to the preparation of brown vat dyes of different shades from acylated glyoxal dianthraquinone. The latter compound is mentioned in the current specification, but it cannot be concluded that these dyes might be particularly useful for printing mixed fibers.

FINISHING WOOL FABRICS———Combined Heat and Freezing Treatment G, 1

Brit P 678,585
(Kostring——Sept 3, 1952)

According to the introduction to this specification, textiles (particularly wool) are never completely free from creases nor are they apt to be ironed when marketed for further use. It is contended that this disadvantage is caused by standard pressing and decatizing methods being carried out at excessively high pressure or with excessively hot steam.

By omitting customary and overly energetic procedures the method outlined in the present patent aims at eliminating these drawbacks in order to obtain crease-free fabrics of clear colors. The fabric is initially conveyed in a slightly moist state over smooth, heated surfaces. (This may be accomplished by passing the material first over a moistened band or felt, thereupon removing excess moisture by suction, and then leading the fabric, preferably covered by a felt wrapper, over the heated surface). Another subsequent moistening step is carried out after the shearing and fluffing up operations and finally the fabric is passed through a freezing chamber at a temperature of min 1° — min 20° C. Here the fiber is frozen, loosened and thereby swollen. The remaining moisture is expelled by leading the goods (surrounded by a wrapper) around a heated metal surface. A full soft hand and a natural glaze are said to result from this combined treatment.

Freezing pretreatments have been advocated for cleaning raw wool material in USP 2,015,893, USP 2,015,894 and Brit P 423,002 (Frosted Wool Co), which describe methods for processing the goods at about 0° F. Here the oily impurities and wool fat are transformed into solid particles while the water contained in the fiber freezes out; both may be removed afterwards by beating, tapping or the like. This temperature does not damage the fiber proper and the wool is left in a loosened state, it is claimed. This process, however, is a *pretreatment; finishing treatments* at low temperature are not mentioned here or in subsequent modifications, such as Brit P 407,331 (Spanke), French P 757,650 (Püschel), etc.

INGRAIN ("FLECK") EFFECTS———Produced in Wool Dyeing C, 4, 06

Brit P 680,862
(Fosse Dyeworks Ltd——Harding——Oct 15, 1952)

"Ingrain" or "Fleck" effects on wool yarns can be defined as contrasting little spots in dyed material. They are chiefly produced by blending white wool with dyed fibers before spinning or by mixing wool or other material of different shades in the spinning process. The latter products are usually termed "melanges."

This objective of this invention is to produce similar effects in one-step dyeing processes using uniform wool material. Obviously effects of this type, obtained in this simplied way on woven or knitted fabrics, would be far more economical and desirable.

It is well known that the wool molecule contains various amino acids bearing one carboxy group (glycine), hydroxy groups (serine), several acidic groups (aspartic acid), basic groups (lysine), sulfur radicles (cystine), etc. According to the present invention, some of the amino acids (not specified) are rendered wholly or partly resistant to acid dyeing when wool is treated with certain substances under appropriate conditions of acidity. For optimum effect the bath must be limited to a pH below 5.5 (preferably below 4.9) when acids are used, or to a pH below 6.2 (preferably below 5.8) when ammonium salts are present in the dyebath.

The substances to be added to the dyebath to produce the aforementioned effect are quite different in character, comprising aldehyde-aromatic sulfonic acid condensates, tannic acid, aromatic sulfonic acids containing at least three sulfonic groups, or, on the other hand, urea-or melamine condensates in a water soluble state. Among these products the condensates of aromatic sulfonic acids with formaldehyde (diphenylmethane disulfonic acid, of one mol formaldehyde and 2 mols cresol-or naphthalene sulfonic acid) are said to be most important. These products must contain at least 2 sulfonic groups. The 88 examples disclosed in the current specification suggest, in most cases, "Erional NW" (cresol sulfonic acid condensed with formaldehyde) or "Lissatan" (an analogous naphthalene condensate).

Dyeing must be carried out in the pres-

(Concluded on Page 316, Col 3)

Proceedings of the
American Association of Textile Chemists and Colorists

Copyright, 1953, American Association of Textile Chemists and Colorists

Editor of Proceedings: **Carl Z Draves, 30 Lahey St, New Hyde Park, N Y**

May 11, 1953

National Officers of the Association

President.....J ROBERT BONNAR, General Dyestuff Corporation, 435 Hudson St, New York 14, N Y

Vice President (Western Region).....ARTHUR T BRAINERD, Ciba Co, Inc, 325 W Huron St, Chicago 10, Ill

Vice President (Central Atlantic Region).....ARTHUR W ETCHELLS, Hellwig Dyeing Corp, Delaware Ave & Comly St, Philadelphia, Pa

Vice President (New England Region)....GEORGE O LINBERG, Synthron, Inc, Ashton, R I

Vice President (Southern Region).....SAMUEL L HAYES, Ciba Co, Inc, P O Box 1988, Charlotte 1, N C

Secretary.....HAROLD C CHAPIN, Lowell Textile Institute, Lowell, Mass

Treasurer.....WILLIAM R MOORHOUSE, National Aniline Division, Allied Chemical & Dye Corp, 150 Causeway St, Boston 14, Mass

Assistant Treasurer.....ALBERT E SAMPSON, National Aniline Division, Allied Chemical & Dye Corp, 150 Causeway St, Boston 14, Mass

Founder.....LOUIS A OLNEY (Deceased)

Chairman of the Research Committee.....CHARLES W DORN, J C Penney Co, Inc, 330 W 34th St, New York 1, N Y

Director of Research.....HAROLD W STIEGLER, Lowell Textile Institute, Lowell, Mass

Standing Committees of the Council

Executive Committee on Research.....LEONARD S LITTLE, *Chairman*
Publicity.....GEORGE H SCHULER, *Chairman*
Conventions.....KENNETH H BARNARD, *Chairman*
Appropriations.....WILLIAM R MOORHOUSE, *Chairman*
Constitution and Bylaws.....HAROLD C CHAPIN, *Chairman*
Membership and Local Sections.....ARTHUR W ETCHELLS, *Chairman*
Corporate Membership.....GEORGE L BAXTER, *Chairman*
Publications.....PERCIVAL THEEL, *Chairman*
Technical Programs.....ELLIOTT MORRILL *Chairman*
Technical Supplies.....CHARLES W DORN, *Chairman*

Councilors

Representing Sections

NEW ENGLAND REGION

Northern New England: EDWARD B BELL, ELMER E FICKETT, FRANK J O'NEIL, SAWYER F SYLVESTER
Rhode Island: RAYMOND W JACOBY, THORWALD LARSON, EDWARD W LAWRENCE, ALDEN D NUTE
Western New England: RAYMOND J CAREY

CENTRAL ATLANTIC REGION

Hudson Mohawk: ALBERT E HERRMANN, JR, JOHN J HANLON
New York: CARL H BRUBAKER, CHARLES W DORN, RALPH M FISCHER, WELDON G HELMUS, PATRICK J KENNEDY, JAMES J MARSHALL, HENRY L YOUNG
Philadelphia: CARLETON T ANDERSON, EDWARD C DIEHL, ANGE E RAIMO, ERNEST E RETTBERG, JR, RICHARD B STEHLE, S GRAEME TURNBULL, JR

SOUTHERN REGION

Piedmont: JOSEPH LINDSAY, JR, LINTON C REYNOLDS, RAPHAEL E RUPP, R HOBART SOUTHER
South Central: GLENN R BELLAMY
Southeastern: C RUSSELL GILL, H GILLESPIE SMITH
Washington: WALTER M SCOTT

WESTERN REGION

Mid-West: ARTHUR I HULTBERG, SAMUEL KLEIN, ELLIOTT MORRILL
Pacific Northwest: GEORGE S BARKER
Pacific Southwest: ROBERT MISHELL

Past Presidents

ELVIN H KILLHEFFER, P J WOOD, WILLIAM H CADY, ALBAN EAVENSON, CARL Z DRAVES, THOMAS R SMITH, WILLIAM D APPEL, HENRY F HERRMANN, C NORRIS RABOLD

Local Section Officers

New England Region

NORTHERN NEW ENGLAND

Chairman.....ERNEST R KASWELL, Fabric Research Laboratories, Inc, 665 Boylston St, Boston 16, Mass
Secretary.....AZEL W MACK, Dexter Chemical Corp, 581 Boylston St, Boston 16, Mass
Vice-Chairman—JOHN M GOULD *Treasurer*—WILLIAM W PENNOCK

RHODE ISLAND

Chairman.....ERNEST J CHORNYEI, Bradford Dyeing Association, Westerly, R I
Secretary.....ROBERT G THOMAS, Rohm & Haas Co, Inc, 2001 Industrial Trust Bldg, Providence 3, R I
Vice-Chairman—ARTHUR F McLEAN *Treasurer*—J WILLIAM TIMPERLEY

WESTERN NEW ENGLAND

Chairman.....RUDOLPH C GEERING, Princeton Knitting Mills, Watertown, Conn
Secretary.....NATHANIEL J GLADE, American Cyanamid Co, Stamford, Conn
Vice-Chairman—ARTHUR S NYQUIST
Treasurer—SOCRATES V VANIOTIS

Central Atlantic Region

HUDSON-MOHAWK

Chairman.....HAROLD S DAHLBERG, Kenwood Mills, Rensselaer, N Y
Secretary.....WILLIAM A NELSON, Ritter Chemical Company, Inc. 403 W Main St, Amsterdam, N Y
Vice-Chairman—IRWIN J SMITH *Treasurer*—JOHN W MERRILL

NEW YORK

Chairman.....WELDON G HELMUS, Fair Lawn Finishing Co, Fair Lawn, N J
Secretary.....NORMAN A JOHNSON, American Dyestuff Reporter, 44 East 23rd St, New York 10, N Y
Vice-Chairman—JOHN H HENNESSEY *Treasurer*—GEORGE A JONIC

PHILADELPHIA

Chairman.....HARRY L MORGAN, James Lees & Sons Co, Bridgeport, Pa
Secretary.....THOMAS J SCANLON, Dexter Chemical Corporation, P O Box 657, Springfield, Delaware County, Pa
Vice-Chairman—FREDERICK V TRAUT *Treasurer*—THOMAS H HART

Southern Region

PIEDMONT

Chairman.....M M McCANN, Warwick Chemical Co, P O Box 825, Burlington, N C
Secretary...CLARENCE HOOPER, Burlington Mills Corp, Burlington, N C
Vice-Chairman.....HENRY A RUTHERFORD
Treasurer.....HERMAN JACKSON JORDAN, JR

SOUTH CENTRAL

Chairman.....EVERETT E BURGNER, JR, Davenport Hosiery Mills, Inc, 400 East 11 St, Chattanooga, Tenn
Secretary...JOSEPH T BOHANNON, JR, American Aniline Products, Inc, 4001 Rossville Blvd, Chattanooga 7, Tenn
Vice-Chairman—PAUL O ANDERSON *Treasurer*—WILLIAM F LUTHER

SOUTHEASTERN

Chairman.....S JACK DAVIS, The Chemstrand Corp, Decatur, Ala
Secretary....JAMES W SWINEY, Fulton Bag & Cotton Mills, Atlanta, Ga
Vice-Chairman—T HOWARD McCAMY *Treasurer*—WILLIAM B AMOS

WASHINGTON

Chairman.....MILTON HARRIS, Harris Research Laboratories, 1246 Taylor Ave, N W, Washington 11, D C
Secretary.....GEORGE S BUCK, JR, National Cotton Council of America, 1832 M St, N W, Washington 6, D C
Vice-Chairman—HENRY D BARKER *Treasurer*—HERBERT A EHRMAN

Western Region

MID-WEST

Chairman....ALFRED J OLSON, Phoenix Hosiery Co, 320 E Buffalo St, Milwaukee 1, Wis
Secretary.....VICTOR H LAWRENCE, Geigy Co, Inc. 629 W Washington Blvd, Chicago, Ill
Vice-Chairman—J GORDON STOTT *Treasurer*—KIRK P FERGUSON

PACIFIC NORTHWEST

Chairman....EDWARD J STEPHEN, Paris Woolen Mills, Stayton, Ore
Secretary....THEODORE M MARSHALL, Nyanza Color and Chemical Co, Inc, 115 SW Fourth Ave, Portland 4, Ore
Vice-Chairman—DON ADAMS *Treasurer*—JOHN L AYRES

PACIFIC SOUTHWEST

Chairman.....ROBERT G BUTLER, Dyecraft, 1148 East 11 St, Los Angeles, Calif
Secretary....ANGUS H ROBERTS, Jacques Wolf & Co, 4308 South Broadway, Los Angeles 37, Calif
Vice-Chairman—SIDNEY SPRINGER *Treasurer*—FRED HASELHORST

Student Chapters

BRADFORD DURFEE TECHNICAL INSTITUTE, CLEMSON COLLEGE, FAIRLEIGH DICKINSON COLLEGE, GEORGIA INSTITUTE OF TECHNOLOGY, LOWELL TEXTILE INSTITUTE, NEW BEDFORD TEXTILE INSTITUTE, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, RHODE ISLAND SCHOOL OF DESIGN, UTICA TECHNICAL INSTITUTE.

Notes from Lowell

Analysis of Fiber Mixtures

THE AATCC Research Committee on Analysis of Fiber Mixtures has been interested in the development of suitable analytical procedures for the quantitative separation of the new synthetic fibers as well as the older fibers, and G J Mandikos and E P Johnstone of the AATCC Research staff at Lowell have cooperated with the Committee in the development of two methods, namely:

1. *Sodium Hydroxide-Sodium Carbonate Method* for the separation of wool from Vicara.

2. *Sodium Hypochlorite Method,* primarily for the separation of wool from dynel, Orlon, nylon, and Dacron. This method can also be used successfully for the separation of wool from all other fibers except the protein-type fibers, i e, silk and Vicara.

These two methods will appear in the *1953 AATCC Technical Manual and Year Book.*

It is expected that a third method will soon be refined for the quantitative separation of Dacron from dynel, Orlon, and nylon.

The Committee has also revised and enlarged 1) the systematic scheme for the qualitative analysis of all fibers and 2) the table of fiber solubilities. These revisions will also appear in the *1953 AATCC Technical Manual and Year Book.*

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

53-17

Education: B S, Textile Engineering, with additional courses in chemistry and business administration.
Experience: textile finishing.
Age: 25; single; veteran; references; textile executive or sales position in northeastern U S preferred. 5-11, 5-25

CALENDAR

AATCC

COUNCIL
June 5 (Hotel Willard, Washington, D C).

NATIONAL CONVENTIONS
September 17-19, 1953 (Hotel Conrad Hilton, Chicago); Sept 15-18, 1954 (Atlanta Biltmore, Atlanta, Ga); Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J).

HUDSON-MOHAWK SECTION
June 19 (Outing).

MID-WEST SECTION
June 13 (Outing, Lake Delavan, Wis); November 7 (Hotel Bismarck).

NEW YORK SECTION
May 22 (Kohler's Swiss Chalet, Rochelle Park, N J); June 19 (Outing, North Jersey CC, Wayne, N J); Sept 25, Oct 3, Nov 20 (Swiss Chalet); Jan 29, Feb 26 (Hotel Statler, N Y); April 23, 1954, May 21, 1954 (Swiss Chalet).

NORTHERN NEW ENGLAND SECTION
May 15 (Andover CC, Andover); June 12 (Annual Outing); Nov 6 (LTI); Dec 4 (MIT Faculty House).

PHILADELPHIA SECTION
May 22 (Outing, Manufacturer's Golf & Country Club); Sept 11; Oct 23; Dec 4; Jan 15, 1954.

PIEDMONT SECTION
June 12-13 (Mayview Manor, Blowing Rock, N C); Sept 12 (Hotel Charlotte, Charlotte, N C).

RHODE ISLAND SECTION
May 22 (Prov Eng Soc); June 12 (Outing, Wannamoisett C C); Oct. 23 (Prov Eng Soc); Dec 4 (Annual Meeting, Sheraton-Biltmore, Providence).

SOUTHEASTERN SECTION
June 19-20 (Outing, Radium Springs).

SOUTH CENTRAL SECTION
May 23 (Patten Hotel, Chattanooga, Tenn); Aug 21-22 (Outing, Chattanooga Golf & Country Club, Chattanooga, Tenn); Dec 5 (Patten Hotel).

WASHINGTON SECTION
June 5 (Hotel Willard, Washington, D C).

WESTERN NEW ENGLAND SECTION
June 19 (Outing, Wallingford Country Club;) Oct 2, Nov 6 and Dec 11 (Rapp's).

Buttons bearing the insignia of the AATCC are now available from the Secretary at a new price of $2.25. Pins, with safety clasp, are also available at $2.50 each. Write directly to H C Chapin, AATCC Secretary, Lowell Textile Institute, Lowell, Mass.

OTHER EVENTS

AMERICAN INSTITUTE OF CHEMISTS
Annual Meeting—New York Chapter, May 21 (Hotel Commodore, New York)

AMERICAN LEATHER CHEMISTS ASSOCIATION
Golden Jubilee Meeting, June 7-10 (Netherland Plaza, Cincinnati)

AMERICAN OIL CHEMISTS' SOCIETY
27th Fall Meeting, November 2-4, Sherman Hotel, Chicago, Ill.

AMERICAN SOCIETY FOR QUALITY CONTROL
Textile Division: May 27-29, Convention Hall, Philadelphia, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS
1953 Annual Meeting, June 29-July 3, Chalfonte-Haddon Hall, Atlantic City, N J; 1953 Fall Meeting, Oct 14-16, New York, N Y.

AMERICAN TEXTILE MACHINERY ASSOCIATION
Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N J.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC
Annual Meeting—25th Anniversary-October 27 (Hotel Belmont Plaza, New York).

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS (Quebec Section)
June 20 (Annual Golf Tournament).

GARMENT DYERS GUILD OF AMERICA
1953 Technical Clinic, June 12-13 (Seneca Dye Works & Hotel Powers, Rochester, N Y)

GORDON RESEARCH CONFERENCES
June 16-Sept 4 (Colby Jr College, New London, N H).

INTERNATIONAL FEDERATION OF TEXTILE CHEMISTS AND COLORISTS ASSOCIATIONS
1953 Congress: September 17-19, Luzern, Switzerland (under the auspices of the Swiss Association of Chemists-Colorists).

LOWELL TEXTILE INSTITUTE ALUMNI ASSOCIATION
All-Alumni Reunion, May 22 (Boston) and May 23 (Lowell).

NEW BEDFORD TEXTILE INSTITUTE ALUMNI ASSOCIATION
Annual Homecoming & Clambake, June 6, New Bedford, Mass.

NEW YORK BOARD OF TRADE (DCAT)
Drug, Chemical and Allied Trades Section; 63rd Annual Meeting, Sept 24-27, Pocono Manor Inn, Pocono Manor, Pa.

SCIENTIFIC APPARATUS MAKERS ASSOCIATION
35th Annual Meeting, May 24-28 (The Greenbriar, White Sulfur Springs, W Va)

SOUTHERN TEXTILE EXPOSITION
October 4-9 (Textile Hall, Greenville, S C)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
June 11-13 (Joint Outing with Manufacturing Chemists' Association at The Greenbrier, White Sulfur Springs, W Va.

TEXTILE INSTITUTE
38th Annual Conference, May 25-29 (Llanduduo, Wales)

TEXTILE RESEARCH INSTITUTE
1953 Annual Meeting, Nov 12-13.

TEXTILE WORKSHOP
3rd Annual Meeting: June 10-July 1, Lowell, Mass.

New York Section Meeting Report

April 17, 1953
Fairleigh Dickinson College, Rutherford, N J

A MEETING of the New York Section was held jointly with the Student Chapter of Fairleigh Dickinson College in the college cafeteria on Friday evening, April 17th. A social hour and dinner preceded the meeting.

The Chairman, Weldon G Helmus, appointed the following nominating committee to report its selections for section officers at the May 22nd meeting to be held at Kohler's Swiss Chalet, Rochelle Park, N J: Patrick J Kennedy, *Chairman,* Henry L Young and Carl H Brubaker.

The Chairman reported that a special train to the Chicago Convention could be arranged if there were a minimum of 125 persons taking the round trip. The train would leave from Hoboken, stopping at intermediate New Jersey points to Dover, and then continue nonstop to Chicago. Persons interested in this special train were requested to contact Charles A Whitehead of the AMERICAN DYESTUFF REPORTER.

The Chairman expressed the appreciation of the Section to the College for making available its facilities for the meeting and to the glee club which entertained during the dinner.

Dr Peter Sammartino, President of Fairleigh Dickinson, welcomed the members and expressed appreciation for the donation which the Section had made to furnish equipment for the Hesslein textile building.

J Robert Bonnar, National President of AATCC, spoke briefly and urged the student members to take full advantage of their membership.

The first paper presented was "Fastness Properties of Curable Resins on Acetate Dyeings" by James Polito, Robert Zecker and Charles Cox, all students at the College. The paper was read by Mr Polito.

Charles L Zimmerman, Research Chemist, Calco Chemical Division, American Cyanamid Company, presented a paper entitled "The Application of Dyes to Textile Fibers at High Temperatures" which was illustrated by slides.

The attendance was approximately 250.

Respectfully submitted,
NORMAN A JOHNSON, *Secretary*

(Left): Those at the Head Table at the New York Section's April 17th Meeting at Fairleigh Dickinson College included: Standing (l to r): George A Jonic, Treasurer; Donald E Marnon, Registration Chairman; J Robert Bonnar, National President; Henry L Young, Patrick J Kennedy and Carl H Brubaker, Councilors.

Seated: Norman A Johnson, Secretary; Edmund A Leonard, Technical Program Chairman; Charles L Zimmerman, Speaker; Weldon G Helmus, Chairman; John H Hennessey, Vice-Chairman; James Polito, Chairman, Fairleigh Dickinson College Student Chapter; and H R Mauersberger, Director, Fairleigh Dickinson College Textile Department.

(Right): Fairleigh Dickinson College Student Chapter, AATCC.

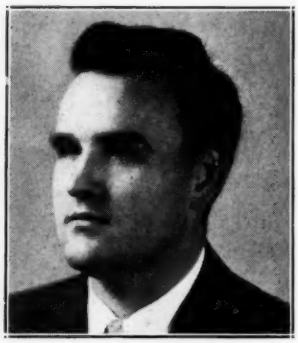
Front Row (l to r): Eichenblatt; Cox; Charlotte Dietrich, Secretary; James Polito, Chairman; Joseph Nosal, Treasurer; Zecker. Back Row: Gliuski, Bonavita, Grundy, Thorp, Mauersberger.

A view of the large group assembled at the New York's Section's annual meeting at Fairleigh Dickinson College, Rutherford, N J.

1952 Intersectional Contest —

A STUDY OF NEW TECHNIQUES IN WARP-SIZE PREPARATION*

SOUTHEASTERN SECTION



W C Carter

An extensive study of paste behavior during cooking, of the effect of high-pressure homogenization, and of paste stability for several different starches has been made in a laboratory with various types of presently available viscometers. The same kind of study has also been carried out in several mills for commercial sizes prepared from pearl corn starch.

COMMITTEE

Walter C Carter, *Chairman and Speaker*
C Russell Gill
John M Newton
Glenn W Anderson
John E MacConville
William F Gerrow, Jr
Frank J Clarke

INTRODUCTION

AN investigation of warp-sizing practices has been long overdue. The trend to the elimination of batch kettle-cooking methods in favor of machine processing has brought this phase of textile wet processing into the position which makes possible a more technical approach.

The laboratory phase of this work involves a study of unmodified rice, potato, wheat, corn starches and sago and tapioca flours with respect to paste behavior during the cooking cycle and the effect of high-pressure homogenization on paste viscosities.

It is generally recognized that one of the variables introducing deviations in the desired size content of warp yarns in the slashing operation is the degree of viscosity stability which the size attains when the mixes are prepared in advance and stored prior to application. It is for this reason that size-mix viscosities and stabilities have been investigated. The scope of this paper is confined to starch-base size mixes normally applied to cotton and some of the synthetic-staple-fiber warp yarns.

The co-operation of several Corporate-Member mills in the Southeast made possible a survey of actual processing methods. The size mixes prepared in these mills were tested for resulting viscosities and viscosity stability. The addition of sizing auxiliaries other than starch was recognized, and the effect of warp-lubricant

* Presented at the Statler Hotel in Boston on Nov 8, 1952, by Walter C Carter for the Southeastern Section.

TABLE I

VISCOSITY AND STABILITY OF HEATED STARCH PASTES AS MEASURED BY VISCOGRAPH

Starch	% Starch By Weight (Dry Basis)	Viscosity in Brabender Units: Maximum	After 30 Min	60	75	Stability Ratio*: 30/Max	60/30	75/60
Corn	4.92	125	110	110	110	.88	1.00	1.00
	5.90	260	200	200	200	.77	1.00	1.00
	6.88	430	325	300	300	.76	.92	1.00
	7.93	575	455	360	360	.79	.96	1.00
	8.92	855	470	455	450	.55	.97	.99
Tapioca	4.83	140	140	130	130	1.00	.93	1.00
	5.75	260	240	225	215	.92	.94	.96
	6.70	470	450	445	440	.91	.99	.99
	7.67	740	590	540	525	.80	.92	.97
	8.12	850	595	570	560	.70	.94	.98
Wheat	4.87	45	40	40	40	.89	1.00	1.00
	5.79	85	70	65	65	.82	.93	1.00
	6.76	175	115	110	110	.66	.96	1.00
	7.72	365	180	165	165	.49	.92	1.00
	8.69	565	350	270	260	.62	.77	.96
	9.57	830	400	350	335	.48	.88	.96
Potato	3.83	255	130	125	115	.50	.96	.92
	4.79	555	220	165	150	.40	.75	.91
	5.36	700	180	165	155	.26	.92	.94
	5.74	880	200	180	175	.23	.90	.97
Rice	4.85	85	80	80	80	.94	1.00	1.00
	5.77	190	140	135	135	.74	1.00	1.00
	6.73	295	200	175	170	.68	.88	.97
	7.69	520	250	240	235	.48	.96	.98
	8.65	805	360	295	290	.47	.82	.98
Sago	4.65	205	105	70	70	.52	.67	1.00
	5.23	315	160	100	100	.51	.63	1.00
	5.53	385	180	105	105	.47	.58	1.00
	6.46	500	260	175	150	.52	.67	.86
	7.38	920	400	260	225	.44	.65	.87

* Stability Ratio—A Comparison of the Amount of Change in Viscosity Between Two Selected Points in the Cycle.

TABLE II

EFFECT OF HOMOGENIZATION PRESSURES ON THE VICOSITY OF CORN STARCH PASTES WHEN INITIAL TEMPERATURE IS CONSTANT

Time in Minutes	Homog Press in p s i	Ultra-Viscoson in U V Units	Initial Temp °F	Final Temp °F	Flow-Type Viscometer in Secs	Brabender Viscograph in B U
0	0	9.0	188	186	NF*	—
4	250	8.0	188	189	NF*	—
8	500	7.5	188	189.5	25.0	220
12	750	7.0	188	191	12.0	—
16	1000	7.0	188	194	9.5	—
20	1250	6.8	188	194	8.9	—
24	1500	6.75	188	197	8.4	—
28	2000	6.5	188	200	9.2	110
32	2500	6.0	188	206	6.3	—
36	3000	6.0	191	207	7.4	—

* No Flow Through Viscometer at This Pressure.

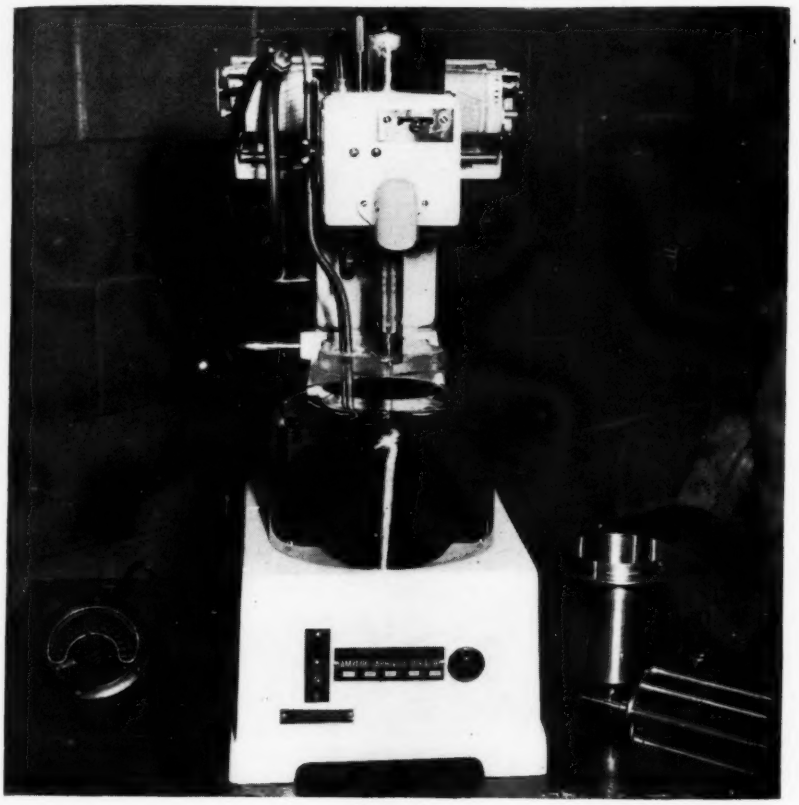


Figure 1
Brabender Viscograph with Bowl, Resistance Measuring Rod, and Timer Removed to Show Details of Construction.

TABLE III

EFFECT OF HOMOGENIZATION PRESSURE ON THE VICOSITY OF RICE STARCH PASTES WHEN INITIAL TEMPERATURE IS CONSTANT

Time in Minutes	*Homog Press in p s i*	*Ultra-Viscoson in U V Units*	*Initial Temp °F*	*Final Temp °F*	*Flow-Type Viscometer in Secs*	*Brabender Viscograph in B U*
0	0	7.75	188	188	NF*	...
4	250	7.0	188	190	NF*	145
8	500	6.5	188	192	NF*	...
12	750	6.25	188	196	9.8	...
16	1000	6.25	188	197	8.5	...
20	1250	6.0	188	198	8.5	...
24	1500	6.0	188	198	8.3	...
28	2000	5.8	188	198	8.2	...
32	2500	5.75	188	200	7.8	...
36	3000	5.5	188	203	7.6	80
40	3500	5.5	188	207	7.8	...
44	4000	5.25	191	210	7.8	...

* No Flow Through Viscometer at This Pressure.

TABLE IV

EFFECT OF HOMOGENIZATION PRESSURES ON THE VISCOSITY OF SAGO STARCH PASTES WHEN INITIAL TEMPERATURE IS CONSTANT

Time in Minutes	*Homog Press in p s i*	*Ultra-Viscoson in U V Units*	*Initial Temp °F*	*Final Temp °F*	*Flow-Type Viscometer in Secs*	*Brabender Viscograph in B U*
0	0	14.5	188	208	NF*	...
4	250	12.5	188	207	NF*	...
8	500	10.0	188	208	NF*	...
12	750	9.5	189	208	NF*	...
16	1000	9.25	189	208	NF*	255
20	1250	9.0	189	208	NF*	...
24	1500	9.0	189	208	NF*	...
28	2000	9.0	189	208	8.8	...
32	2500	9.25	189	208	8.8	...
36	3000	9.25	189	208	8.9	170
40	3500	9.25	189	208	8.5	...
44	4000	9.0	191	209	8.4	...

* No flow.

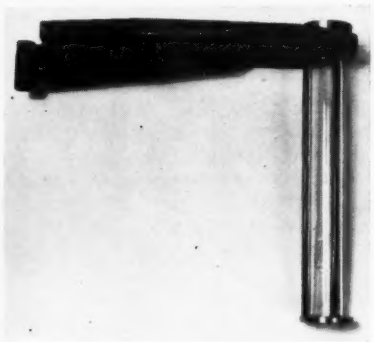


Figure 2
Flow-Type Viscometer

addition on the resulting hot-paste viscosities was considered constant by reason of ingredient analysis and amounts used.

Apparent viscosities of the laboratory- and mill-prepared hot pastes were obtained with the following instruments:

1) *The Brabender Amylograph-Viscograph* (Fig 1).

This instrument is an automatic recording, torsion-type viscometer, capable of measuring viscosities at increasing or decreasing temperatures.

2) *A Flow-Type Viscometer* (Fig 2).

This instrument measures the apparent relative viscosities of hot starch pastes in terms of seconds required for a definite volume of liquid to flow through an orifice.

3) *Ultra-Viscoson* (Fig 3).

The Ultra-Viscoson consists of a probe, to which are applied ultrasonic waves and an electronic computer for converting probe output into viscosity measurements. In the case of Newtonian liquids the instrument is said to measure the product of viscosity and density in centipoises times density, and for non-Newtonian liquids, apparent viscosity times density.

4) *Brookfield Synchro-Lectric Viscometer (Multi-Speed Model LVF)* (Fig 4).

This instrument measures the drag produced upon a spindle rotating at a definite constant speed while immersed in the material under test.

LABORATORY STUDY**

EXPERIMENTAL——The laboratory investigation consisted of two separate phases:

1) Cooking cycles for unmodified corn, potato, rice and wheat starches and sago and tapioca flours.

2) Homogenization studies of unmodified corn, rice, and potato starches and sago flour.

** The laboratory portion of this work was conducted by Frank J Clarke in partial fulfillment of the requirements for the degree of MS at Georgia Institute of Technology.

For the cooking cycles, the Brabender Viscograph was used. The starch to be tested was mixed with sufficient water to bring the total volume to 450 ml. The suspension was stirred for one minute with an electric stirrer and placed in the Brabender instrument. With the cooling coil in a "down" position, the thermoregulator was set to rise from 25 to 92°C (197.6°F) at a constant rate of 1.5°C per minute. The time required for this temperature rise was 45 minutes. The temperature was then held constant at 92°C (197.6°F) for an additional 75 minutes, the total time for the cooking cycle then amounting to two hours. The moisture loss during the cooking cycle was determined. The viscosity limits imposed by the Viscograph determined the starch concentrations employed. The instrument automatically recorded the viscosity history of the entire cooking cycle, the units of viscosity being expressed in Brabender Units.

In all of the laboratory homogenizations studies, a starch concentration of one pound per gallon of slurry was employed. The prepared slurry was preheated by passing it through a heat exchanger. In order to study the effect of various homogenizing pressures on the resulting paste viscosities, the slurries were, in every case, preheated to 188°F (86.7°C).

The apparent viscosities of the homogenized hot pastes were measured with the Brabender Viscograph, the Ultra-Viscoson, and a flow-type viscometer.

RESULTS——

1) *Cooking Cycles.* Typical cooking cycles for the six unmodified starches are shown in Fig. 5. These cycles are for approximately equivalent starch concentrations. All starch concentrations have been expressed as percent starch by weight on a bone-dry basis. The actual moisture contents of the starch samples used were determined to be as follows: wheat, 10.2%; tapioca, 10.4%; corn, 10.6%; rice, 10.6%; potato, 13.8%; and sago, 14.2%.

The maximum viscosity and viscosity-stability data for the various starch pastes are shown in Table I. In addition to the maximum viscosities, the viscosities after 30, 60 and 75 minutes of cooking at 92°C (197.6°F) are given. From these data, the viscosity-stability ratios have been calculated according to the method of Higginbotham (1).

This ratio is simply a comparison of the amount of change in viscosity between two selected points in the cooking cycle. It should be noted that, during these cooking cycles, there is a moisture loss of approximately ten percent; and a stability ratio of 1.00 does not truly indicate stabil-

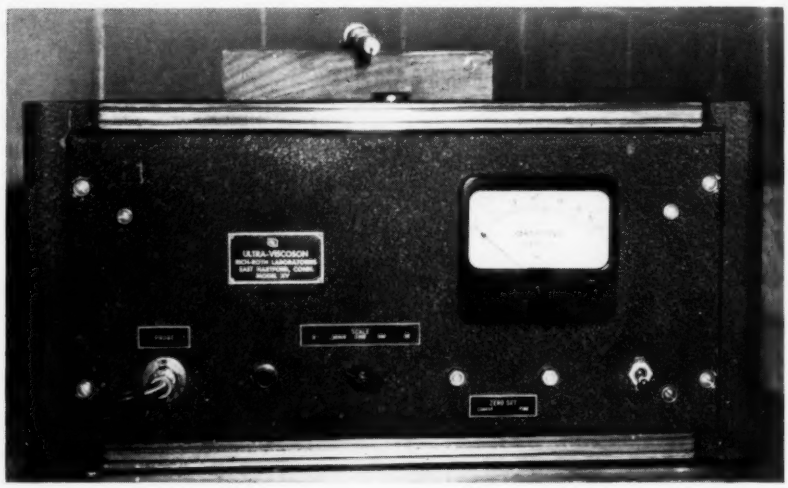


Figure 3
Rich-Roth Laboratories Ultra-Viscoson with Probe

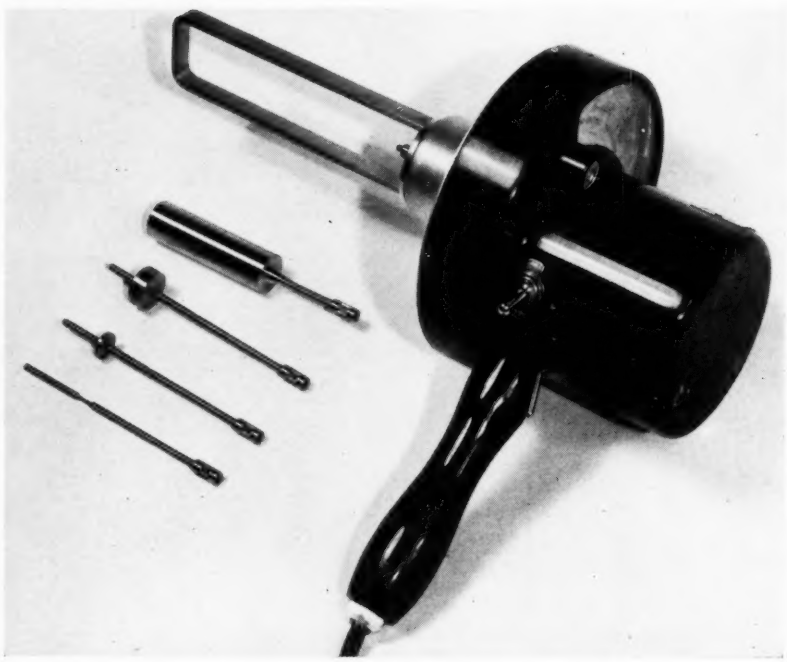


Figure 4
Brookfield Synchro-Lectric Viscometer

TABLE V

EFFECT OF HOMOGENIZATION PRESSURE ON THE VISCOSITY OF POTATO STARCH PASTES WHEN INITIAL TEMPERATURE IS CONSTANT

Time in Minutes	*Homog Press in p s i*	*Ultra-Viscoson in U V Units*	*Initial Temp °F*	*Final Temp °F*
0	0	15	188	188
4	250	—	—	—
8	500	14	188	192
12	750	—	—	—
16	1000	12.5	188	197
20	1250	10.2	189	199
24	1500	10.5	189	199
28	2000	8.5	189	200
32	2500	8.0	190	204

ity but simply means that, in a given time interval, the rise in viscosity due to moisture loss would be exactly compensated by a decrease in viscosity due to breakdown of the starch pastes. In no case was an increase in viscosity observed after the points of maximum viscosity had been reached.

The viscosity data shown in Table I are presented graphically in Figs 6-11, and the comparison of data for the starches is shown in Fig 12. It is noted that a straight line relationship exists for log-log plots of maximum viscosity versus starch concentration and for viscosity after two-hour cooking cycle versus starch concentration. The former relationship has been shown previously by Rask and Alsberg (2) and by Anker and Geddes (3).

2) *Homogenization Study.* The effects of homogenizing pressures on the resulting hot-paste viscosities are shown in Tables II-V. The data are presented graphically in Figs 13 and 14. It is noted that there is a leveling out of the apparent viscosities as the homogenizing pressure is increased. As the pressure of homogenization is increased, there is a marked increase in the temperature of the starch pastes. The gradual fall in viscosities at the higher pressures is due, in part, to these higher temperatures at which the viscosities are determined. The viscosity measurements with the Brabender Viscograph were all made at 197.6°F (92°C).

As shown in Table VI, the homogenized pastes have considerably lower viscosities than the respective cooked pastes.

MILL SURVEY

The Committee transported the same instruments used in the laboratory to the mill warp-size preparation areas for obtaining the apparent viscosities of the size mixes prepared under actual mill-processing procedures. All of the cooperating mills were sizing carded-cotton warp yarns with mixes containing pearl corn starch, and size preparation was being accomplished with Girdler Corporation's Votator*, Manton Gaulin's Homogenizer, and Scott & Williams' Hydropulse*.

The Votator size-preparation unit accomplishes high-temperature cooking (256°F) by passing a cold slurry mix through three processing cylinders, which are steam-jacketed. Heat transfer is effected by introduction of high-pressure steam into the annular space around the inner slurry chamber and by rotation of scraper blades at high speed (445 rpm) within the slurry chamber to expose a constantly changing portion of the slurry to the heat-transfer surface of the processing cylinders. With the Votator at Mill A the mix was processed continuously at the rate of about 250 gallons per hour, forced through an extrusion valve so as to produce 100 psi back-pressure, and delivered to storage kettles in distant slasher rooms through steam-jacketed stainless-steel pipes.

An interesting feature of this size preparation system is that the cold slurry mix is prepared in the starch-storage area in batches of 376 gallons at a time by measuring the addition of 345 gallons cold water to the slurry-mixing tanks through re-set automatic water meters, by adding the sizing auxiliaries by volume measurement, and by emptying into this mix three 100-pound bags of starch.

Mills B and D, employing Gaulin Homogenizers, first introduce live steam into the mixes through open circular coils located at the bottom of cooking kettles to bring the temperature of the batches to 205°F. At this point the finished volume is measured and adjusted to the desired level with the addition of hot or cold water, and the viscous heated batch is then pumped to the homogenizer. At Mill B, the practice is to leave the undelivered portion of the heated batch, which adheres to the bottom and sides of the cooking kettle, in the kettle to comprise a portion of the next mix; at Mill D this residue is cleaned from the kettle with cold water and flushed out before water is drawn through meters for the mix following. At Mill B the steam is cut off the heating kettles after batch temperatures reach 205°F, whereas, at Mill D, batch temperatures are maintained at 205°F with live steam during homogenization of the batch.

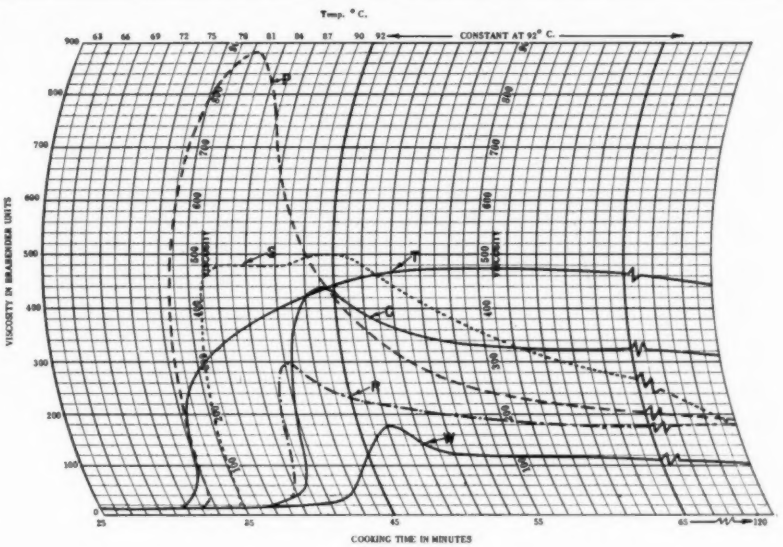


Figure 5
Maximum and Level Viscosities of Six Unmodified Starches Prepared by Heating Starch Pastes and Measured by Viscograph

Legend	Conc (%)
P—Potato	5.74
S—Sago	6.46
T—Tapioca	6.70
C—Corn	6.88
R—Rice	6.73
W—Wheat	6.76

TABLE VI

A COMPARISON OF THE VISCOSITIES OF HOMOGENIZED AND HEATED STARCH PASTES

Starch	*% Starch (Dry Basis)*	*Homogenization Pressure (p s i)*	*Viscosity Homogenized Starch (B U)*	*Viscosity of Cooked Starch Pastes* (B U)*	*Difference (B U)*
Corn	10.8	500	220	800	580
	10.8	2000	110	800	690
Sago	14.0	1000	255	940	685
	14.0	3000	170	940	770
Rice	10.8	250	145	470	325
	10.8	3000	80	470	390

* These values were determined by extropolation of the log viscosity versus log starch concentration plots as shown in Figures 7, 8, and 10.

* Registered Trade-Marks

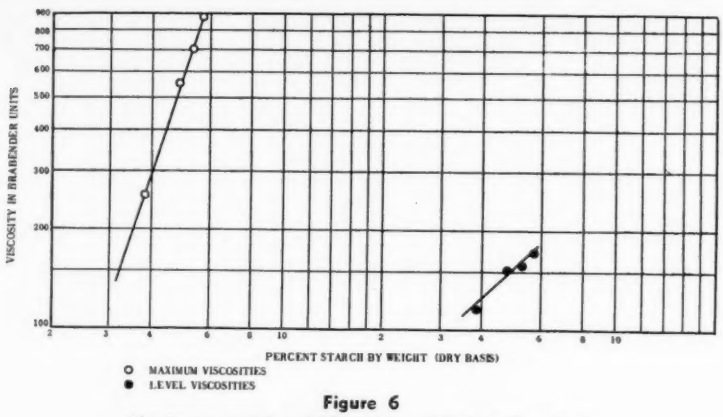


Figure 6
Maximum and Level Viscosities of Potato Starch as Measured by Viscograph

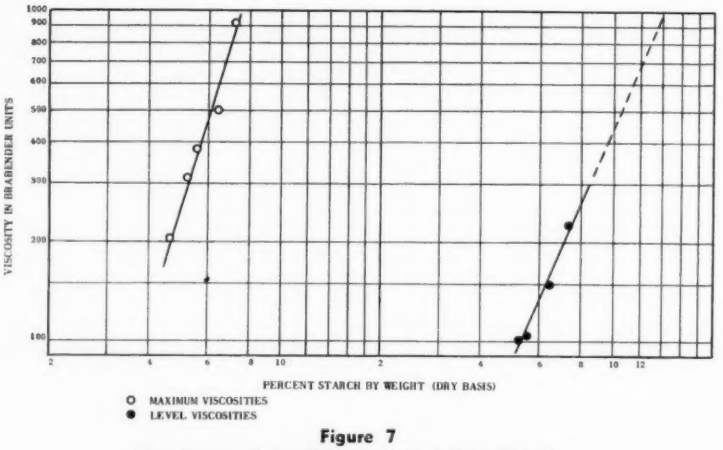


Figure 7
Maximum and Level Viscosities of Sago Starch as Measured by Viscograph

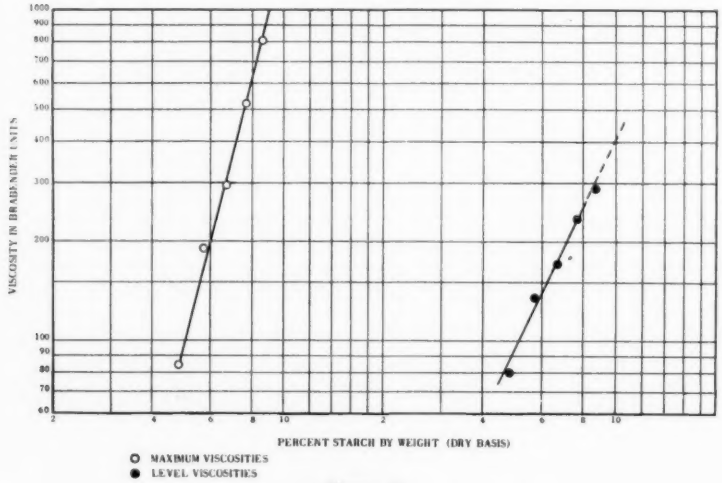


Figure 8
Maximum and Level Viscosities of Rice Starch as Measured by Viscograph

Cold-slurry preparation for the Hydropulse mixes is similar to that employed with the Votator; the cold-slurry mix is transferred to the Hydropulse unit, which consists of a heat exchanger connected in tandem with a high-pressure homogenizer so that the mix is heated and homogenized in a continuous-flow system. A booster pump on the heat exchanger forces slurry through the steam-jacketed tube heater and thence to the intake of the high-pressure homogenizer. Heat transfer is effected with steam at 50 to 90 pounds pressure, and steel scraper blades are rotated at 45 rpm within the slurry chamber to cause a changing portion of the heated slurry to be exposed to the heat-transfer surface of the steam-jacketed heating tube. The temperature of the heated slurry mix as it is pumped to the homogenizer is instrument-controlled in the range $188 \pm 4°F$, and homogenizer pressures of 1500 psi are employed to process 150 gallons of finished size continuously per hour.

MILL A

Processing Units: VOTATORS (Girdler Corporation).

Size Mix: 12.4 oz pearl corn starch per finished gallon.

50 ml 35% hydrogen peroxide per 376 gallons cold slurry.

4.2% fatty-matter addition on basis of starch weight.

Procedures: Cold slurry mix pumped to VOTATORS, which heat mix to 256°F. Prepared size then piped to slasher-room storage kettles through steam-jacketed stainless-steel piping.

MILL B

Processing Units: HOMOGENIZERS (Manton-Gaulin Manufacturing Company).

Size Mix: 14.25 oz pearl corn starch per finished gallon.

3.7% fatty-matter addition on basis of starch weight.

Procedures: Batch is heated with live steam to 205°F in cooking kettle. Steam is cut off heated mix while mix is pumped to homogenizer operating with 1000 psi on each stage of two-stage homogenizing valve. Mix then goes to storage kettles.

MILL C

Processing Units: HYDROPULSES (Scott & Williams, Inc).

Regular Size Mix: 15.2 oz pearl corn starch per finished gallon.

4.0% fatty-matter addition on basis of starch weight.

Heavy Size Mix: 17.9 oz pearl corn starch per finished gallon.

4.1% fatty-matter addition on basis of starch weight.

Procedures: Cold slurry mix is passed to Hydropulse where heat-exchange units heat mix to $188 \pm 4°F$, thence to homogenizers operating at 1500 psi, thence to storage kettles.

MILL D

Processing Units: HOMOGENIZERS (Manton-Gaulin Manufacturing Company).

Light Size Mix: 12.5 oz pearl corn starch per finished gallon.
3.4% fatty-matter addition on basis of starch weight.

Heavy Size Mix: 14.7 oz pearl corn starch per finished gallon.
3.5% fatty-matter addition on basis of starch weight.

Procedures: Batch is heated to 205°F with live steam and temperature is maintained at 205°F while it is pumped to homogenizers, which are 1) operated at 2000 psi on one stage of two-stage homogenizing valve, or 2) pressure-controlled with Visco-Mat (Minneapolis-Honeywell Regulator Company). Under control 2) the homogenizer pressure is varied over the range 1700 to 2400 psi. From homogenizer delivery the processed size is passed to storage kettles; under Visco-Mat control the processed size passes to storage through a well containing a Brookfield Viscometer adapted to a flow system. In this survey two homogenizers, #1 and #2, preparing heavy size mix were under Visco-Mat control.

MILL E

Processing Units: HYDROPULSES (Scott & Williams, Inc).

Size Mix: 15.5 oz pearl corn starch per finished gallon.
3.8% fatty-matter addition on basis of starch weight.

Procedures: Cold slurry mix is passed to Hydropulses, where heat exchanger heats mix to 188 ± 4°F, to homogenizing units operated at 1500 psi, and thence to storage kettles.

INSTRUMENTS ——— During these mill surveys, apparent viscosities were obtained with the flow-type viscometer, the Ultra-Viscoson, the Brookfield Synchro-Lectric Viscometer, and the Brabender Amylograph.

In addition to these instruments, already briefly described, the Committee encountered mill applications of the Norcross Viscometer to recording storage-kettle and size-box viscosities. There are installations where this particular instrument has been adapted to record apparent viscosities at a point in a flow system, but such an installation was not included in this survey.

The use of the Corn Industries Research Foundation Viscometer was considered, but it was not thought to be well adapted to portability. For the requirement of portability without disturbance of calibration, the Brabender and Brookfield Viscometers proved to be best adapted to this particular study. The Ultra-Viscoson used in the laboratory investigation was relatively difficult to calibrate for static readings in the field, and it was not available to the investigators during some of the mill surveys.

The modified flow-type tube viscometer was employed throughout this investigation. The particular orifice size which was

TABLE VII

MILL DATA

VOTATOR

8/18/52——MILL A——12.4 ozs starch per gallon

Time Sample Taken	*Apparent Viscosity Timed Flow in Seconds*	*Test Sample Temp °F*	*Remarks*
12:50 PM	13.1	196 ± 2	Mix #1
3:50 PM	12.0	196 ± 2	Mix #2
	Ultra-Viscoson Units		
1:50 PM	11.25	196	Mix #1
2:50 PM	11.0	196	Mix #2
4:20 PM	9.5	197	Mix #3
5:20 PM	7.0	197	Mix #4
	Initial Brabender Units		
12:50 PM	152		Mix #1
3:50 PM	142		Mix #2
8/19/52	*Timed Flow in Seconds*		
8:23 AM	11.4	196 ± 2	Mix #1
10:12 AM	11.0	196 ± 2	Special Mix, without H_2O_2
	Ultra-Viscoson Units		
8:54 AM	12.25	197	Mix #1
9:24 AM	7.5	198	Mix #1
9:54 AM	7.25	196	Mix #1
10:42 AM	6.75	197	Special Mix, without H_2O_2
11:12 AM	9.0	195	Special Mix, without H_2O_2
11:42 AM	7.0	198	Special Mix, without H_2O_2
	Initial Brabender Units		
10:12 AM	149	198 ± 1	Special Mix, without H_2O_2
11:48 AM	140	198 ± 1	Mix #2

TABLE VIII

MILL DATA

GAULIN HOMOGENIZER

8/21/52——MILL B——14.25 oz starch per gallon

Time Sample Taken	*Apparent Viscosity Timed Flow in Seconds*	*Test Sample Temp °F*	*Remarks*
10:52 AM	7.5	194 ± 2	Middle of Batch 1
1:27 PM	8.4	194 ± 2	Middle of Batch 3
2:55 PM	7.2	194 ± 2	Start of Batch 4
3:33 PM	7.0	194 ± 2	End of Batch 4
4:25 PM	7.5	194 ± 2	Start of Batch 5
	Brookfield Units (Speed-6, Spindle 1)		
11:25 AM	338	192	Middle of Batch 2
11:37 AM	437	192	Middle of Batch 2
2:55 PM	115	198	Start of Batch 4
1:22 PM	224	198	Storage Kettle
1:52 PM	196	198	Storage Kettle
2:22 PM	205	198	Storage Kettle
3:08 PM	220	198	Storage Kettle
3:50 PM	213	198	Storage Kettle
4:40 PM	225		
	Ultra-Viscoson Units		
11:03 AM	6.75	194 ± 2	Middle of Batch 1
11:52 AM	12.0	194 ± 2	Middle of Batch 2
12:26 PM	15.0	194 ± 2	End of Batch 2
12:52 PM	14.75	194 ± 2	Start of Batch 3
1:17 PM	6.0	208	Storage Kettle
	Initial Brabender Units		
10:52 AM	103	198 ± 1	Middle of Batch 1
1:27 PM	133	198 ± 1	Middle of Batch 3
2:55 PM	92	198 ± 1	Start of Batch 4
3:33 PM	98	198 ± 1	End of Batch 4
4:25 PM	114	198 ± 1	Start of Batch 5

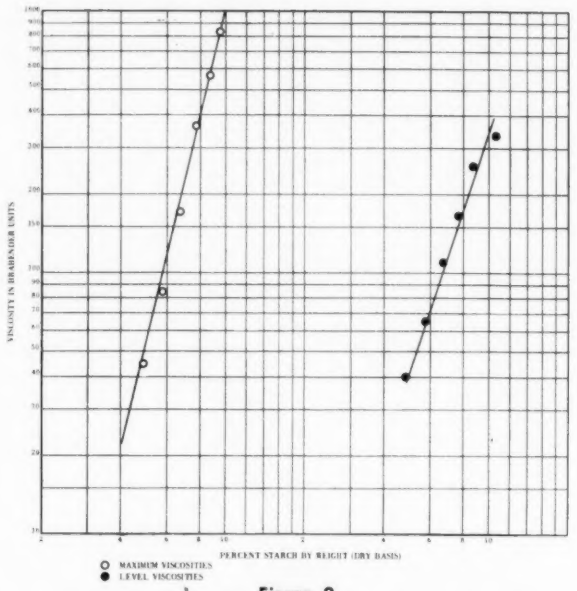


Figure 9
Maximum and Level Viscosities of Wheat Starch as Measured by Viscograph

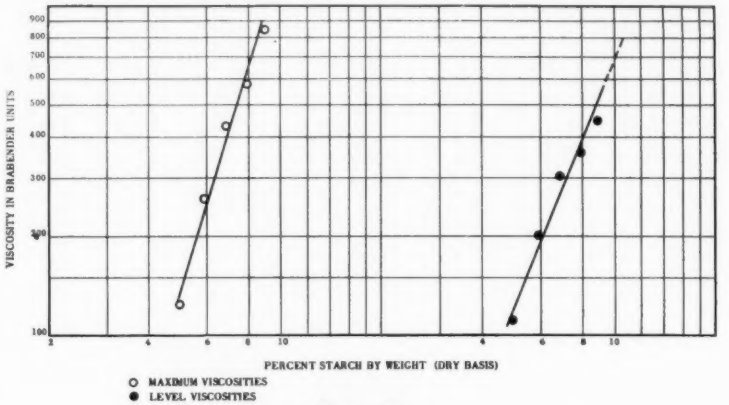


Figure 10
Maximum and Level Viscosities of Corn Starch as Measured by Viscograph

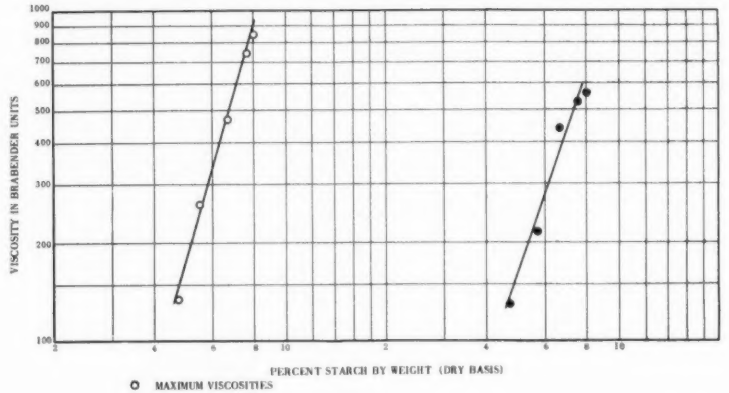


Figure 11
Maximum and Level Viscosities of Tapioca Starch as Measured by Viscograph

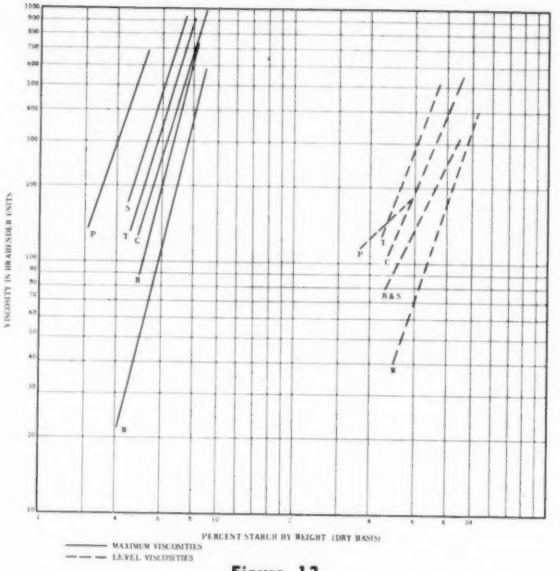


Figure 12
Summary of the Maximum and Level Viscosities of Six Unmodified Starches as Measured by Viscograph

P—Potato C—Corn
S—Sago R—Rice
T—Tapioca W—Wheat

Figure 11
Maximum and Level Viscosities of Tapioca Starch as Measured by Viscograph

P—Potato
S—Sago
T—Tapioca
C—Corn
R—Rice
W—Wheat

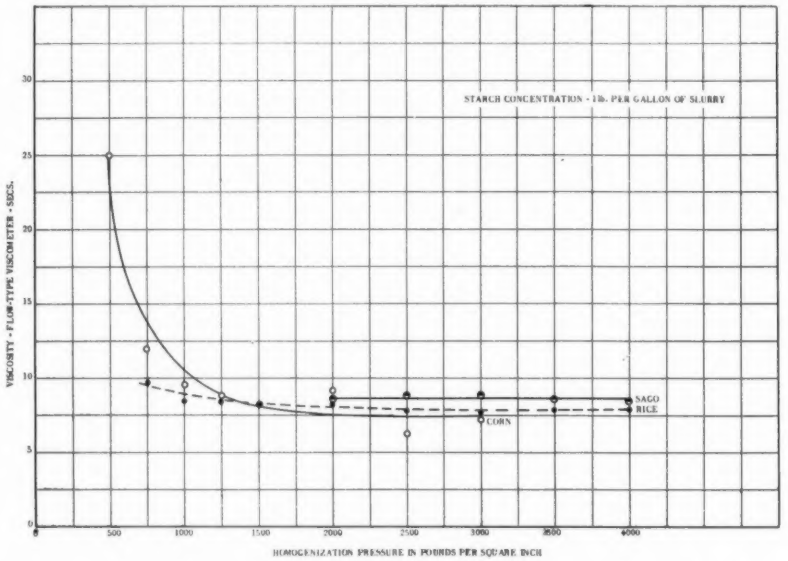

STARCH CONCENTRATION - lb. PER GALLON OF SLURRY
VISCOSITY - FLOW-TYPE VISCOMETER - SECS.
HOMOGENIZATION PRESSURE IN POUNDS PER SQUARE INCH
SAGO
RICE
CORN

Figure 13
Effect of Homogenization Pressure on the Viscosity of Sago, Rice, and Corn Starches, When Initial Temperature is Constant, as Measured by Flow-Type Viscometer

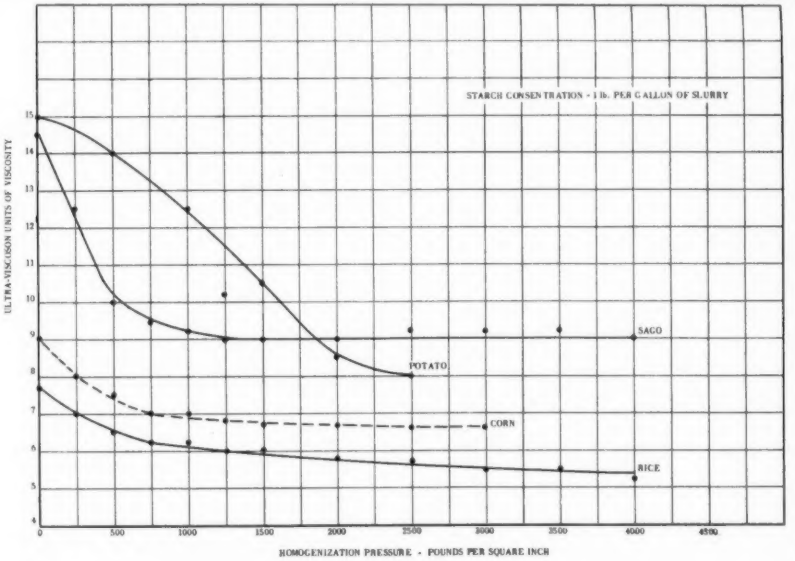


Figure 14
Effect of Homogenization Pressure on the Viscosity of Sago, Corn, Rice, and Potato Starches, When Initial Temperature is Constant, as Measured by Ultra-Viscoson Viscometer

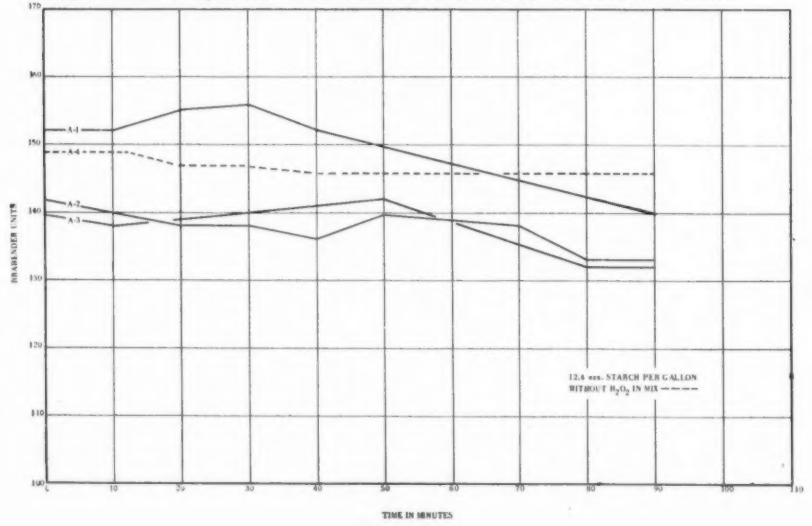


Figure 15
Mill A (8/19/52)——Votator

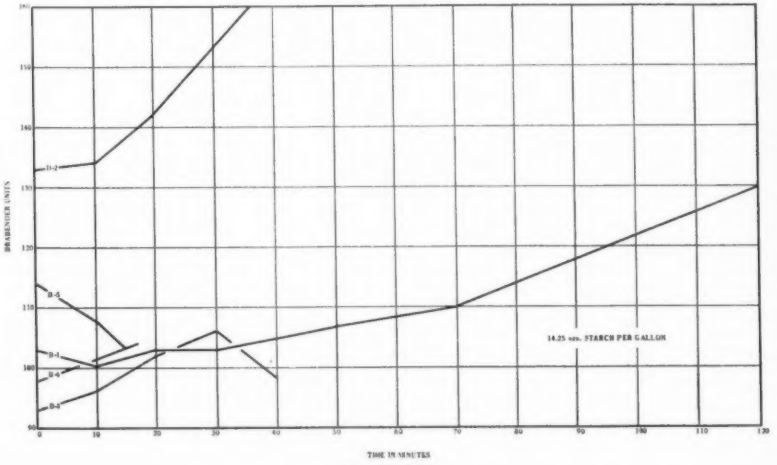


Figure 16
Mill B (8/21/52)——Homogenizer

TABLE IX

MILL DATA

SCOTT & WILLIAMS' HYDROPULSE

8/26/52——MILL C——15.2 oz starch per gallon——Regular Mix
17.9 oz starch per gallon——Heavy Mix

Time Sample Taken	Apparent Viscosity Timed Flow in Seconds	Test Sample Temp °F	Remarks
			Regular Mix
10:34 AM	9.75	188	Batch 1, Hydropulse #1
11:27 AM	9.75	192	End Batch 1, Hydropulse #1
12:04 PM	10.2	190	Start Batch 2, Hydropulse #1
12:47 PM	10.2	190	Middle Batch 2, Hydropulse #1
1:34 PM	10.5	185	Start Batch 3, Hydropulse #1
2:13 PM	9.6	184	Start Batch 4, Hydropulse #1
			Heavy Mix
10:55 AM	9.9	193	Start Batch 1, Hydropulse #2
11:38 AM	10.2	194	Middle Batch 1, Hydropulse #2
12:12 PM	10.0	192	End of Batch 1, Hydropulse #2
3:10 PM	10.3	194	Middle Batch 2, Hydropulse #2
	Brookfield Units (Speed-6, Spindle 1)		
			Regular Mix
10:45 AM	287	188	Batch 1, Hydropulse #1
11:22 AM	289	188	Batch 1, Hydropulse #1
12:04 PM	417	183	Batch 2, Hydropulse #1
12:06 PM	424	183	Batch 2, Hydropulse #1
1:34 PM	442	183	Start Batch 3, Hydropulse #1
2:52 PM	498	182	Start Batch 4, Hydropulse #1
			Heavy Mix
11:05 AM	172	190	Batch 1, Hydropulse #2
11:38 AM	150	194	Batch 1, Hydropulse #2
11:44 AM	138	194	Middle Batch 1, Hydropulse #2
12:12 PM	161	194	End of Batch 1, Hydropulse #2
3:10 PM	214	194	Middle Batch 2, Hydropulse #2
3:18 PM	229	192	Middle Batch 2, Hydropulse #2
3:42 PM	184	196	End of Batch 2, Hydropulse #2
	Initial Brabender Units		
			Regular Mix
10:24 AM	142	198 ± 1	Batch 1, Hydropulse #1
1:34 PM	162	198 ± 1	Start Batch 3, Hydropulse #1
2:43 PM	146	198 ± 1	Start Batch 4, Hydropulse #1
			Heavy Mix
3:10 PM	180	198 ± 1	Middle Batch 2, Hydropulse #2

TABLE X

MILL DATA

GAULIN HOMOGENIZER

8/26/52——MILL D——12.5 oz starch per gallon——Light Size
14.7 oz starch per gallon——Heavy Size

Time Sample Taken	Apparent Viscosity Timed Flow in Seconds	Test Sample Temp °F	Remarks
			Light Size
5:55 PM	8.5	198	Batch 1, Homogenizer #3
7:53 PM	8.25	200	Batch 2, Homogenizer #3
9:20 PM	8.25	200	Batch 3, Homogenizer #3
			Heavy Size
6:15 PM	9.0	198	Batch 1, Homogenizer #1
6:40 PM	9.0	198	Start Batch 2, Homogenizer#1
7:17 PM	9.0	198	Batch 3, Homogenizer #2
9:52 PM	9.0	198	Batch 4, Homogenizer #1
	Brookfield Units (Speed 6, Spindle 1)		
			Light Size
5:55 PM	62	188	Batch 1, Homogenizer #3
7:53 PM	60	184	Batch 2, Homogenizer #3
8:19 PM	58	186	End Batch 2, Homogenizer #3
9:20 PM	49	192	Batch 3, Homogenizer #3
			Heavy Size
6:40 PM	118	190	Start Batch 2, Homogenizer #1
6:50 PM	107	195	Batch 2, Homogenizer #1
7:17 PM	98	198	Batch 3, Homogenizer #2
9:52 PM	92	194	Batch 4, Homogenizer #1
10:00 PM	86	196	Batch 4, Homogenizer #1
	Initial Brabender Units		
			Light Size
5:55 PM	80	198 ± 1	Batch 1, Homogenizer #3
8:15 PM	83	198 ± 1	End Batch 2, Homogenizer #3
9:20 PM	82	198 ± 1	Batch 3, Homogenizer #3
			Heavy Size
9:52 PM	100	198 ± 1	Batch 4, Homogenizer #1

satisfactory for the laboratory evaluation of relatively high-viscosity pastes did not prove sensitive enough to indicate significant changes in hot-paste viscosities in the field. A range of orifice sizes is available in this type of instrument, and two were used in these investigations.

Since the product samples taken in the field varied in initial temperatures over the range 182 to 212°F, depending upon the equipment and procedures used, it should be noted that comparisons in the viscosity of size mixes produced at different mills must be evaluated with some regard to the time required to equalize temperatures in the Brabender cup, and also with regard to the varying temperatures at which the static Brookfield and flow-type viscometer readings were necessarily made.

The mill viscosity data are presented in Tables VII-XII and in Figs 15-20.

COMMENTS ON MILL DATA——At Mills B and C there was definite evidence of faulty preparation procedures, which resulted in some nonuniformity in apparent viscosities.

The management at Mill B had earlier expressed to the Paper Committee their concern over the deviation from standard in the size content of their slashed yarns. When the Mill B survey data and the viscosity-versus-homogenizing-pressure data presented earlier in this paper were disclosed to management, some immediate adjustments were made in the preparation and homogenizing procedures, and the Committee was invited by the mill to repeat the survey.

The homogenizing pressure had been previously hand-set by applying 1000 psi to each stage of the two-stage homogenizing valve so that the final gauge pressure reading was 2000 psi. This procedure was altered by eliminating one pressure stage entirely and applying the 2000 psi to one stage only. This change produced a size of lower viscosity, and it was deemed necessary to increase the starch concentration from 14.25 to 14.6 oz per gallon to maintain the standard 12½% added size on the slashed yarns. Batch heating procedures were altered to maintain the kettle-heated paste at 205°F during the time required to homogenize each batch. Previously the steam had been cut off to avoid further dilution of the batch with condensed steam, but it was observed that the paste temperature dropped to as low as 155°F during this period in some of the uninsulated cooking kettles. The initial volume of water was also adjusted to allow for the addition of two one-hundred-pound bags of starch rather than weighing 195 pounds from bins.

The viscosity data obtained after these adjustments were made indicated some im-

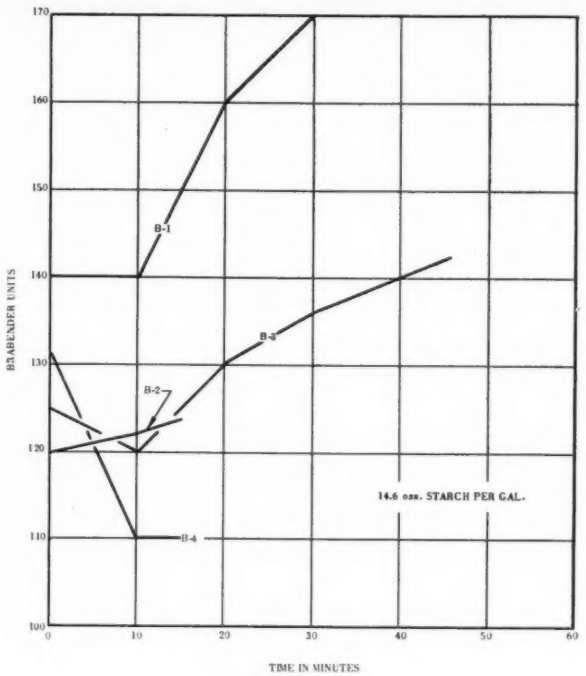


Figure 17
Repeat Survey
Mill B (9/5/52)——Homogenizer

provement in uniformity, but during this recheck there was strong evidence that the condition of homogenizing valve surfaces have a decided influence on the resulting hot-paste viscosities. The Committee feels this warrants further investigation.

At Mill C both the static Brookfield Viscometer readings and the Brabender time graphs disclosed faulty processing with one of the Hydropulse units. This is clearly shown from the Brabender graph for two samples taken at Mill C, Fig 18. In these instances the product temperature at the homogenizer outlet registered only 182-184°F with the hand thermometer used while taking product samples, whereas the indicating thermometer in the line was registering a preheating temperature of 194°F and the product temperature recorder showed 204°F. Recalibration of the temperature-recording and indicating equipment by the mill was necessary to overcome this defection. Rechecks after adjustment of temperature control were not made during this survey since there were other samples taken at this mill which indicated proper performance as to preheating temperatures. From earlier investigations (*4*) with the model heat exchanger-homogenizer apparatus, it was developed that the minimum preheating temperature required of a pearl-corn-starch paste in the concentration of 16 ounces per gallon of slurry was 182°F in order to effect maximum reduction in paste viscosity upon homogenization. These data are shown in Fig 21.

In analyzing the apparent viscosity values obtained with the various instruments it had been expected that some correlation might have developed which would allow reporting viscosities in absolute units, poises or stokes, or in units of specific viscosity. Working with non-Newtonian liquids of varying densities and temperatures made this impractical.

The Brookfield instrument proved the most sensitive to changes in apparent viscosity; the Brabender instrument demonstrated excellent adaptability to the study of hot-paste viscosities at constant temperatures; and, under the conditions imposed in this survey, both the Ultra-Viscoson and flow-type viscometers were somewhat insensitive.

Sampling and viscosity-measurement techniques could be improved in future investigations, particularly if they were adapted to determine viscosity differences with more standardized procedures.

Of some significance to this comparison of mill viscosities are the rates of congealing and the pasting characteristics of the processed size. It was evident to the investigators that, where defections were found in processing procedures, the amount of congealing apparent in the Brabender cup at the end of each test period, particularly around the metal pins, was drastically increased. Pasting characteristics of the various mill sizes were observed, first upon the initial cooling, and then at regular intervals over a period of weeks. The original differences in paste characteristics were marked, particularly with respect to rigidity, and these same differences were evident during all subsequent examinations.

There are several opinions as to the significance of paste rigidity obtained from the various size preparation methods; certainly the differences are discernible, and further investigations on this subject should be made to establish the relationship with sizing properties.

TABLE XI

MILL DATA

SCOTT & WILLIAMS' HYDROPULSE

9/5/52——MILL E——15.5 oz starch per gallon

Time Sample Taken	*Apparent Viscosity Timed Flow in Seconds (Small Orifice)*	*Test Sample Temp F°*	*Remarks*
2:42 PM	38.0	188	Batch 1, Hydropulse #3
3:36 PM	37.2	192	Batch 2, Hydropulse #1
3:44 PM	35.4	194	Batch 2, Hydropulse #1
	Brookfield Units (Speed 6, Spindle 1)		
2:33 PM	233	186	Batch 1, Hydropulse #3
3:36 PM	167	188	Batch 2, Hydropulse #1
3:54 PM	132	190	Batch 3, Hydropulse #3
	Initial Brabender Units		
2:33 PM	100	198 ± 1	Batch 1, Hydropulse #3
3:00 PM	122	198 ± 1	Batch 2, Hydropulse #3
3:36 PM	122	198 ± 1	Batch 2, Hydropulse #1
3:54 PM	101	198 ± 1	Batch 3, Hydropulse #3

SUMMARY

1) Cooking-cycle curves were obtained with the Brabender Amylograph-Viscograph for six commercial unmodified starches, from which stability-ratio results were calculated and reported.

2 The effect of homogenization in reducing viscosities of heated starch pastes was determined with the flow-type viscometer, Brabender and Ultra-Viscoson instruments. For each starch there is a particular homogenization pressure which effects the maximum reduction in paste viscosity.

3) Size mix formulations and preparation procedures at five mills were reported, and the size processing equipment was identified and briefly described.

4) The apparent viscosities of mill-prepared warp-size mixes were determined with the Brabender, Brookfield, Ultra-Viscoson and flow-type viscometers. Where inconsistencies in mill viscosity data were apparent, it became possible to interpret defections from the laboratory study data.

5) The value of adapting instrumentation to continuously record and/or control size-mix viscosity in flow systems is evident. These instruments should signal the need for a manual or automatic correction when size is not being prepared within predetermined viscosity limits.

6) The mill survey indicates fields for future investigation on the effect of homogenizing valve surfaces on paste viscosity, and the relationship that may exist between the congealed-paste characteristics and sizing properties.

This study indicates the value of mill viscosity determinations with continuous size-processing equipment as a scientific basis for insuring more uniform viscosities to reduce deviations in the added size content of warp yarns in the slashing operation.

ACKNOWLEDGMENTS

The Intersectional Contest Paper Committee of the Southeastern Section, A A T C C, gratefully acknowledges the assistance of the Brabender Corporation, Rochelle Park, New Jersey; The Brookfield Engineering Laboratories, Inc, Stoughton, Massachusetts; Rich-Roth Laboratories, East Hartford, Connecticut; and Penick and Ford, Ltd, Cedar Rapids, Iowa, in providing the instruments employed in this work. Acknowledgments are made to National Starch Company and to Stein-Hall and Company, Inc, for providing the starches used in the laboratory studies.

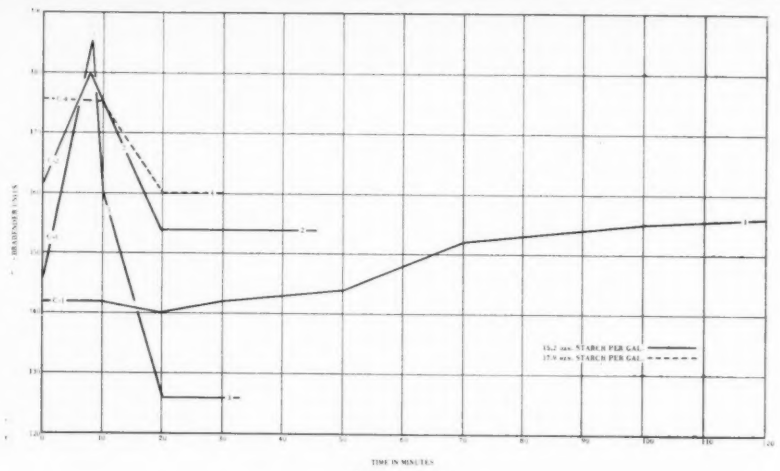


Figure 18
Mill C (8/26/52)——Hydropulse

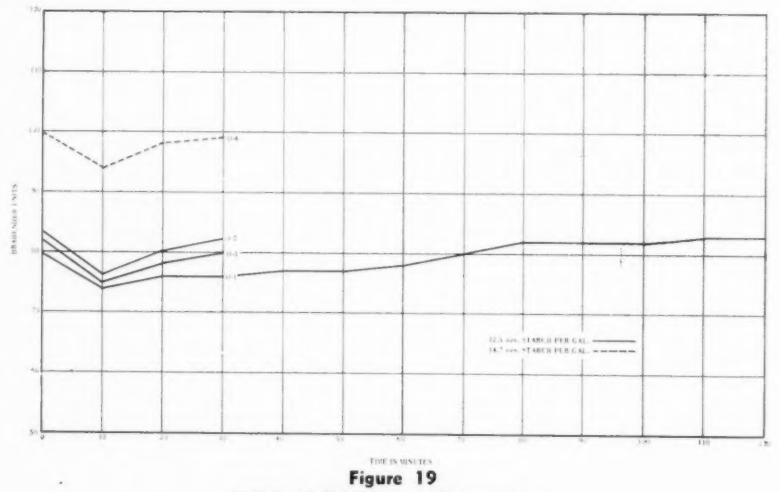


Figure 19
Mill D (8/26/52)——Homogenizer

TABLE XII
MILL DATA
GAULIN HOMOGENIZER

9/5/52——MILL B (REPEAT SURVEY)——14.6 oz starch per gallon

Time Sample Taken	*Apparent Viscosity Timed Flow in Seconds (Small Orifice)*	*Test Sample Temp °F*	*Remarks*
9:54 AM	50.5	190	Batch 1
11:00 AM	40.0	198	Batch 2, New Homogenizer Valve
12:28 PM	36.5	200	Batch 3, New Homogenizer Valve
	Brookfield Units (Speed 6, Spindle 1)		
9:42 AM	500	192	Batch 1
11:00 AM	240	198	Batch 2, New Homogenizer Valve
11:21 AM	186	195	End Batch 2, New Homogenizer Valve
12:24 PM	162	195	Batch 3, New Homogenizer Valve
	Initial Brabender Units		
9:38 AM	140	198 ± 1	Batch 1
11:05 AM	120	198 ± 1	Batch 2, New Homogenizer Valve
11:20 AM	125	198 ± 1	End Batch 2, New Homogenizer Valve
12:22 PM	132	198 ± 1	Batch 3, New Homogenizer Valve

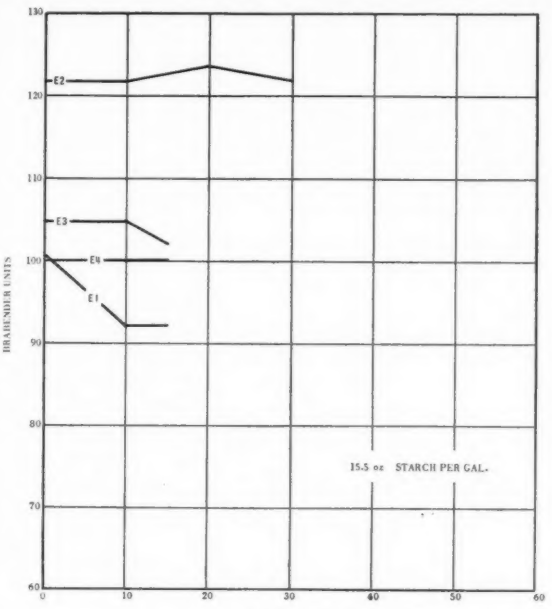


Figure 20
Mill E (9/5/52)——Hydropulse

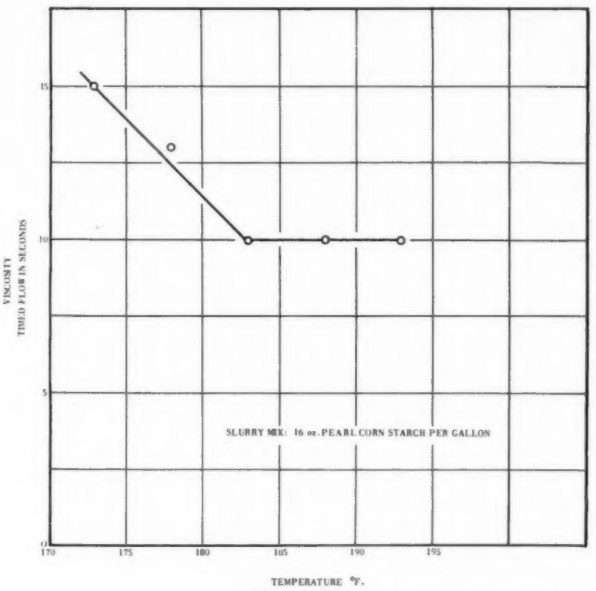


Figure 21
Viscosity at Varying Preheating Temperatures with Constant Homogenizer Pressure of 2000 psi

The Committee also wishes to express its thanks to the A French Textile School, Georgia Institute of Technology, and to the cooperating mills for the use of their facilities and their cooperation in making this study possible.

REFERENCES

(1) Higginbotham, R S, "The Flow of Starch Pastes—Part IV", *J Textile Inst* 38, T131 (1949).

(2) Rask, O S and Alsberg, C L, "A Viscosimetric Study of Wheat Starches", *Cereal Chem* 1, 7-26 (1924).

(3) Anker, C A and Geddes, W F, "Gelatinization Studies Upon Wheat and Other Starches with the Amylograph", *ibid* 21, 335-360 (1944).

(4) La Roche, Evans, Thesis at Georgia Institute of Technology (1951).

Plans Set for Philadelphia Section Outing

PLANS are completed for the 1953 Outing of the Philadelphia Section, to be held Friday, May 22 at the Manufacturers Golf and Country Club, Oreland, Pa. A E Raimo, John Campbell Co, Chairman of the 1953 Outing Committee, has observed that there will be a large turnout this year and accordingly, arrangements have been made to have dinner served continuously from 5 to 8, at which time prizes will be awarded to winners of the day's events. A floor show will follow dinner.

The usual contests in darts, cards, quoits and putting will be held in addition to the annual golf tournament. As an added feature of the latter event, the Section is donating a low gross trophy this year. The competition is expected to be as keen as ever for the low net trophy currently held by Thomas C Jordan, W H & F Jordan Chemical Co, Inc.

Outing Committee members include:

GOLF:
Clarence A Seibert, Scholler Bros, Inc.
Arthur Schneider, Masland Wilton Mills.
Albert De F Frank, Alex C Fergusson Co.
Edward J Smith, Nyanza Color and Chemical Co.

DARTS, QUOITS, CARDS:
John H Hulton, W E Hulton Dyeing Co.
George J Moffitt, Jr, American Aniline Products, Inc.
Thomas C Holst, Laurel Soap Mfg Co.
Leo J Clark, Continental Mills, Inc.

PRIZES:
Joseph A Clark, Sr, Leatex Chemical Co.
William J Brink, Leatex Chemical Co.

DINING:
Frank Nevins, Ciba Co, Inc.
Donald W Robinson, Alco Oil & Chemical Corp.

ENTERTAINMENT:
John W Jordan, Para-Chem Inc.
John L Fancourt, W F Fancourt & Co.

SAVINGS BOND SALES:
John M Jester, Jr, Amalgamated Chemical Corp.
Edward C Diehl, Ankokas Dyeing & Processing Co.
J Walter Huber, Onyx Oil & Chemical Co.
John Koch, Jr, Darby Dyeing & Finishing Co.

PHOTOGRAPHY:
George Altenbaumer, Fred Whitaker & Co.

RESERVATIONS:
Ernest W Empting, General Dyestuff Corp.
M Bartholomew, Krout & Fite Mfg Co.
John R Smith, Florence Thread Co.
Dominic A Siravo, Hess, Goldsmith & Co, Inc, Horace Linton Div.

FINANCE:
Thomas H Hart, Hart Products Corp.
Frederick V Traut, Globe Dye Works.
Christian W Holweger, Royce Chemical Corp.
Thomas R Scanlan, Jr, Hart Products Corp.
Richard E Nickerson, E I du Pont de Nemours & Co, Inc.

PUBLICITY AND PRINTING:
Joseph W MacNeil, American Aniline Products, Inc.

Piedmont Section Report

THE spring meeting of the Piedmont Section was held at the Robert E Lee Hotel, Winston-Salem, N C, on April 11.

At the morning session two papers were given by students of the Textile School of Clemson College: "Vat Dyeing of Orlon, Dacron, and Orlon-Wool, Dacron-Wool Blends" by F L Wickham, Jr and Paul N Robinette, *speaker* and "Cross Dyeing Orlon or Dacron and Wool Piece Goods at Ordinary Temperatures" by Charles Simpson and Lonny Howard, *speaker*.

Following this a research meeting was held with Neal A Truslow, U S Rubber Company, Winnsboro, S C, presiding.

A technical session held in the afternoon featured two papers: "Problems in Dyeing Synthetic Fiber Blends" by Edward Szlosberg, Sandoz Chemical Works and "Recent Developments in Continuous Dyeing" by Boyce C Bond, Pittsburgh Coke & Chemical Company.

The banquet was held in the ballroom with W F Luckenbach, Jr, Virginia Smelting Company, as guest speaker.

The technical program attracted approximately 150 members and 130 attended the banquet.

"THE APPLICATION OF VAT DYES"

Monograph No 2

American Association of Textile Chemists and Colorists

MONOGRAPH NO 2, dealing with "The Application of Vat Dyes" has been prepared by a Board of Editors and Collaborators in the American Association of Textile Chemists and Colorists. This group represents a complete cross-section of the entire industry so that the text of the Monograph represents latest information both from laboratory and practical plant standpoints.

The Monograph contains approximately 385 pages with contents of various chapters as follows:

I *HISTORY*—Natural Indigo and Tyrian Purple; Development of Synthetic Vat Dyestuffs; History of Application of Vat Dyes; The Application of Vat Dyes to Fibers Other Than Cotton.

II *PRINCIPLES OF VAT DYE APPLICATION*—Types and Forms of Vat Dyes in Commerce; Chemistry of Application; Stripping and Redyeing Faulty Vat Dyeings; Fastness; Print Discharges; Change of Shade in Artificial Light; Dichroic Dyes.

III *APPLICATION TO COTTON RAW STOCK*—Equipment Used; Methods of Color Application; Typical Examples.

IV *APPLICATION TO COTTON SKEINS*—Equipment and Methods.

V *APPLICATION TO COTTON WARPS*—Short Chain Method; Long Chain Warp Dyeing; Continuous Pigment Padding Method.

VI *APPLICATION TO COTTON PACKAGES*—The Package; Package Dyeing Machines; Chief Factors in Dyeing Packages with Vat Dyestuffs; Dyeing Speed and Levelling Power of Vat Dyes; Dyeing Methods; Oxidation and Finishing; Vat Dyeing on Beams; Illustrative Dyehouse Procedures.

VII *APPLICATION TO COTTON PIECE GOODS*—History; Jig Methods; Padding Methods; Continuous Methods; Overhead Reel Method; Vat Dyeing of Cotton Narrow Fabrics.

VIII *HOSIERY*—Application of Colors to Cotton Hosiery; Application of Colors to Mixed-Fiber Hosiery.

IX *APPLICATION TO FIBERS OTHER THAN COTTON*—Vat Dyeing of Viscose Rayon; Vat Dyeing of Cellulose Acetate; Vat Dyeing of Nylon; Vat Dyeing of Animal Fibers.

X *GENERAL PRINCIPLES OF PRINTING*—Piece Goods; Forms Other Than Piece Goods.

XI *PRINTING*—Direct Printing with Vat Dyestuffs; Discharge Printing with Vat Dyestuffs; Goods Dyed After Printing.

XII *INDIGO*—History and Properties; Various Indigo Vats and their Preparation; Dyeing of Cotton with Indigo; Dyeing of Wool with Indigo; Application of Indigo to Cotton Printing; Indigo Derivatives.

XIII *THE USE OF VAT DYES AS PIGMENTS OR IN NONTEXTILE APPLICATIONS* — Paper; Rubber, Plastics and Resins; Fireworks; Paints and Lacquers; Resin-Bonded Pigments; Miscellaneous.

XIV *LEUCOESTERS OF VAT DYESTUFFS*—History and Chemistry; Properties; Application of Leucoesters; Light Fastness of Leucoesters; Relative Costs of Vat and Soluble Vat Dyeing.

XV *TABULATION OF VAT DYESTUFFS*—Formulae and Properties; Numerical Index; Alphabetical Index; Trade Names of American-Made Vat Dyes.

AUTHOR INDEX
SUBJECT INDEX

From the foregoing, it is seen that this Monograph gives a very comprehensive description of all of the factors involved in the application of vat dyes. In all discussions of application procedure, practical working formulas are given. This publication is, undoubtedly, of interest to all persons who are either producers or consumers of vat dyes.

The price of "The Application of Vat Dyes" is $5 per copy, postpaid, to members; to nonmembers it is $6 per copy. Please use the order form at the bottom of this page.

Dr H C Chapin, National Secretary
American Association of Textile Chemists and Colorists
P O Box 28, Lowell, Massachusetts

Enclosed is my check for $..... covering payment of ..... copies of "The Application of Vat Dyes" at $5.00 per copy.

Enclosed is my check for $..... covering payment of ..... copies of "The Application of Vat Dyes" at $6.00 per copy.

Name ..... Address .....

.....

.....

NEWS

• Interchemical Investigations Point to Simplified Dyeing of Dacron

On the basis of laboratory results reported to date, Interchemical Corporation's Textile Colors Division, Hawthorne, N J, advises that the dyeing of Dacron in full, deep shades at temperatures as low as 180°F now appears possible. Interchemical's procedure, using Interchem acetate dyes, is essentially the same as for dyeing acetate and nylon, with the exception that phenylmethyl carbinol is added to the dyebath as a carrier.

This new development is said to provide the following major advantages:

Provides full, deep shades on Dacron at 180°F.

Dyes can be applied in a neutral bath, without necessity for pH control. They can also be applied in acid or alkaline baths, which is particularly advantageous in union dyeing certain blends, such as Dacron-wool, Dacron-viscose, and Dacron-acetate blends.

Phenyl methyl carbinol does not have to be converted into its sodium salt before use as a carrier.

Eliminates carrier removal problems. Because phenyl methyl carbinol is water-soluble, it can be removed after dyeing by rinsing with warm water.

Reduces dyeing time and provides savings in steam costs.

• Solvay to Produce Potassium Carbonate in New Plant

Solvay Process Division, Allied Chemical & Dye Corporation, announces that it will proceed at once with construction of a new plant for production of potassium carbonate at its works in the Village of Solvay, N Y. The new plant reportedly will provide substantially increased capacity for the manufacture of this product in order to meet anticipated increased demands from industry.

Cost of new installation, including buildings and equipment, will be in excess of $2,000,000, it is stated. Work will be started immediately with the construction schedule calling for completion in the second quarter of 1954.

Liquid, calcined and hydrated grades will be produced in the new plant. New facilities will include the latest materials handling equipment for shipment of packaged and bulk product.

CORRECTION

Re: "The Physical Action of Surface-Active Agents in the Mechanism of Detergency."

ATTENTION is called to a printing error in the second column of page 228, April 13th issue, wherein a transposition of type seriously affects the continuity of the article, "The Physical Action of Surface-Active Agents in the Mechanism of Detergency", by Henri L Rosano and Marianne Weill.

The correct arrangement of type, as it should appear directly below Figure 2b, follows:

* * * *

and the magnitude of the hysteresis cycle is also lowered. If the movement of the plate in relation to the interface be brought down to an extremely low rate, the cycle can be still further reduced. But these conditions are far removed from those of practical detergency.

In the speed range varying from 4 to 25 seconds for a 1/10 mm movement of the plate, the interfacial wettability cycle has a value close to $2\gamma_1$, the plate emerging from the oil enters the aqueous detergent solution as if it were completely wetted by the oil, then going in the opposite direction it enters the oil as if it had become completely wetted by the aqueous solution.

HYSTERESIS OF INTERFACIAL WETTING——N K Adam *(1)*, on examining under the microscope some wool fibers that had been coated with lanoline and plunged into a solution of sodium cetyl sulfate, noted the formation of globules on the fiber. In the presence of the detergent the dirt gathered together at one point on the fiber. According to Adam, the process of detergency seems to consist in reduction of the contact angle measured in the aqueous phase from 180° to 0° *(2, 3)*. As Adam remarks, the contact angle is not really zero, since the droplet remains attached to the solid by a peduncle (Fig 3).

* * * *

NOTE

IT SHOULD be noted that the new Philadelphia area sales office of the Fine Chemicals Division, Pittsburgh Coke & Chemical Company, will expedite shipments of dyestuffs, and *not* dyestuff intermediates, as previously announced.

• New Reichhold Division in New England

Paul L Swisher, vice-president in charge of sales and advertising, Reichhold Chemicals, Inc, advises that the Company has set up a manufacturing division in Ballardvale, Mass, for the production of synthetic resins and basic industrial chemicals for the textile and plastic industries in New England.

As previously noted, Henry H Reichhold, RCI chairman, acquired substantial interest in Watson-Park Co (Ballardvale, Mass), which reputedly has a production capacity of 25,000,000 lbs of formaldehyde annually, and a tank storage capacity of better than 200,000 gallons.

Howell F Shepard, Watson-Park president and treasurer, has indicated that plant expansion is being instituted to increase the Company's capacity of detergents, dyestuffs, fulling compounds, resins and other textile chemical preparations. Mr Shepard recently succeeded Kenneth Bell Park, former president, who is now serving the Company as a consultant.

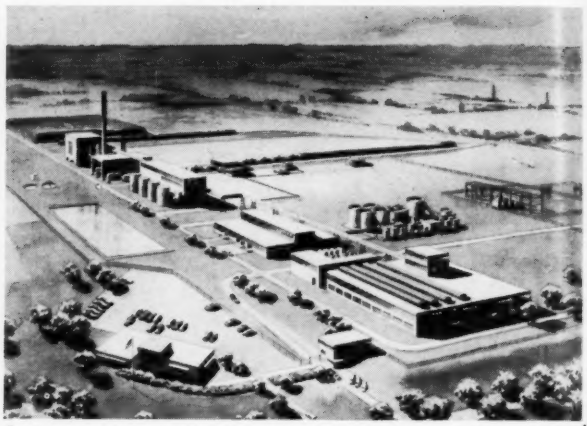
• Textile Quality-Control Discussion at ASQC Parley

The third day of the American Society for Quality Control's 7th Annual Convention, set for May 27, 28 and 29 at Convention Hall, Philadelphia, Pa, will be devoted to problems in textile quality-control, under the sponsorship of ASQC'S Textile Division.

During the morning session, starting at 8:30, E S Rudnick, Director of Research, Wamsutta Mills, will speak on "Statistics in Textiles with an Application." A panel discussion on Evenness Testing, with D S Hamby, Associate Professor of Yarn Manufacturing, School of Textiles, North Carolina State College, as moderator, will follow.

In the afternoon session, starting at 2:30, A G Klock of Bigelow-Sanford Carpet Co will deliver a paper on "The Textile Industry," after which Jules Labarthe, Senior Fellow, Mellon Institute of Research, speaks on "The Consumer's Stake in Textile Quality." W S Smith, West Point Mfg Co, will be moderator for the afternoon meeting.

Delta Finishing Plant with New Warehouse Addition



Architect's conception of $12,000,000 Hooker Electrochemical Company plant now under construction at Montague, Michigan, and scheduled for completion by the year's end. The 500-acre site has 200 acres set aside as a salt brine field (area where drilling derricks are shown). Hooker Type S3-A electrolytic cells will be used to convert brine into caustic soda, chlorine, and hydrogen.

• Warehouse Addition Complete at Delta Finishing Plant

The Delta Finishing plant division of J P Stevens & Company, Inc located at Wallace, South Carolina, has completed a new major warehouse addition at the rear of the original structure. Both this addition and the original plant were built by the Daniel Construction Company of Greenville, South Carolina and Birmingham, Alabama. A part of the building includes storage area.

• SAMA Annual Meeting Set for May 24-28

The 35th annual meeting of the Scientific Apparatus Makers Association will be held this year at The Greenbrier, White Sulphur Springs, West Virginia, May 24-28. Members of the association's 206 company groups are planning to send one or more representatives to this year's meeting, it is learned.

Highlighting the annual SAMA Dinner Meeting, May 27, Lyman J Briggs, former Director of the National Bureau of Standards, and an honorary director of SAMA will receive the association's award for outstanding achievement and service to the scientific instrument industry.

Bausch & Lomb Optical Company, Rochester, New York, celebrating their 100th anniversary this year, will also be honored by receiving a 100-year certificate from the apparatus makers and suppliers commemorating the event at the dinner.

The business theme of this year's meeting of the scientific apparatus makers and suppliers will revolve around analyzing the industries' present and future economic position in the American economy and the improvement and betterment of business methods and procedures for the future.

Arno H Johnson, Vice President and Director of Research, J Walter Thompson Co, New York, N Y, will address the first general session of the group on Wednesday morning, May 27, on the long-range business outlook as related to long-range planning for the instrument industry.

Members attending the first general session will also hear O R Strackbein, Chairman of The National Labor-Management Council on Foreign Trade Policy discuss the problem of protecting highly strategic industries, such as the apparatus and instrument makers from damage due to import competition. Henry Fowler, former director of the Office of Defense Mobilization, will conclude the morning's program by reviewing Department of Defense policies concerning industries vital to the nation's security and defense.

"Cutting Office Costs" will be handled by John L Marley, John L Marley & Company, Chicago management consultant, during the Distributor's Session on Wednesday afternoon, May 27.

Those in attendance at the second combined session of the manufacturers and distributors group on Thursday, May 28, will hear Marvin Bower, McKinsey & Company, management consultants, discuss, "Building a Business Organization for the Future".

Section meetings featuring a range of topics, from various aspects of taking physical inventory to better communications between the industry and its many "publics", are also planned.

The tentative schedule of sessions for the entire meeting follows:

Sunday, May 24—Section Executive Committee Meetings, starting with luncheon

Monday, May 25—Morning—Section Business Meetings. Afternoon—Group meetings and committee meetings

Tuesday, May 26—Morning—Annual Business Meeting and Public Information Program. Afternoon—Golf Tournament

Wednesday, May 27—Morning—Combined Session for Manufacturers and Distributors. Afternoon—Distributors Session. Evening—Annual Dinner

Thursday, May 28—Morning—Combined Session for Manufacturers and Distributors

• "Parade" Publisher to Address DCAT

Arthur H Motley, publisher of "Parade" Magazine, Director of the Chamber of Commerce of the United States, and Past Chairman of the National Sales Executives, will be the guest speaker at the DCAT Spring Luncheon Meeting on Tuesday, May 26th, at the Hotel Astor.

• Whistlclean Official Discusses Expansion Plans

Joseph A Lichterman, vice president and general manager of The Whistlclean Corporation, speaking at a recent sales meeting held in conjunction with the opening of the corporation's new offices at 404 Fourth Avenue, New York City, declared that the detergent industry is still in its infancy and revealed plans for expanding his sales organization and its scope of operations.

• GAF Reduces Prices on Two Vinyl Ethers

General Aniline & Film Corporation has reduced its development prices on Methyl Vinyl Ether and Ethyl Vinyl Ether to a point where the methyl ether is now 20 cents a pound and the ethyl ether, 25 cents a pound. GAF points out that, at this new lower price level, Methyl Vinyl Ether becomes one of the cheapest commercially available monomers.

These products, available from GAF's development program of high-pressure acetylene derivatives, are being produced on a semicommercial scale and further price reductions are anticipated by the manufacturer when commercial production is achieved.

• Stein, Hall Awarded Merit Certificate

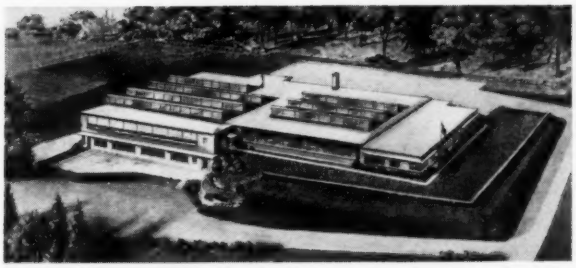
At a recent presentation ceremony at City Hall, New York, Stein, Hall & Co was awarded that city's Certificate of Business Merit by Mayor Vincent R Impellitteri. Morris S Rosenthal, president, accepted the Certificate on behalf of the Company.

The Certificate proclaimed, "Signal honor and recognition to Stein, Hall & Co, Inc for eminent community service, for distinguished contribution to the economic welfare of the people of the City of New York, and for playing a vital role in the commercial development of the City of New York for the past 75 years".

• Integra-Leeds & Northrup Formed

The formation of Integra-Leeds & Northrup Ltd, Birmingham, England, has been jointly announced by Charles S Redding, President of Leeds & Northrup Company, Philadelphia, and Maurice Bouffart, Managing Director of S A Integra, Liege, Belgium.

The new firm succeeds to the business formerly conducted in Birmingham under the name of The Integra Co, Ltd, which was a branch of the Liege firm and for some years has been the English agent for L&N products. That business will be expanded to include the manufacture of the products of both Leeds & Northrup Company and S A Integra. Ownership of Integra-Leeds & Northrup Ltd is shared by Leeds & Northrup Company and the owners of the former Integra Co Ltd. Managing Director will be Jean Rogister, heretofore Manager of the Birmingham firm. Mr Redding will be a member of the new company's Board of Directors.



Home of The Foxboro Company, Ltd, at Montreal, Canada. New extension, at the left, provides 23,000 square feet of additional space for the production of Foxboro Instruments.

• CATCC Visits Foxboro's Montreal Factory

An inspection tour of the Montreal Factory of The Foxboro Company, Limited, on March 21st gave members of the Canadian Association of Textile Colourists and Chemists, Quebec Section, an opportunity to observe the operations in the assembly of industrial instruments and to note the construction of instruments used for the measurement and control of process variables in Canada's textile industry.

Visitors were able to view the new extension to Foxboro's Montreal Factory, their second major expansion in the past five years. Of modern brick and steel construction, the building consists of two main levels, the lower level containing a new cafeteria for employees and training school facilities for customers' men.

A discussion and display of new developments in Foxboro Instrumentation was held by company officials, under the direction of J H Bolton, Managing Director, and E J M Exworth of Peacock Brothers, Ltd, exclusive Foxboro sales representatives in Canada and Newfoundland.

Officials of the Silk and Rayon Dyers and Printers Association of America are welcomed to the Philadelphia Textile Institute before their panel discussion on Industrial Relations held for the Senior Class on March 10. Left to right are Dean Richard S Cox, PTI, with Silk and Rayon Dyers Association officials David L Benetar, general counsel; Charles A Grant, executive secretary; Dean M Lewis, president; Major Joseph F Wildebush, vice-president; and PTI director Bertrand W Hayward.

• Rossville Looks to Double Production in '53

At a recent meeting of stockholders in Staten Island, N Y, William C Hall, executive vice president, Rossville Dyestuff Corporation, announced that production would be more than doubled during 1953 to meet the anticipated demand for the firm's products. Rossville manufactures dyestuffs for the cotton and rayon trades.

• New Chemical Process Equipment Firm Formed in Jersey

George B Allen, former sales manager of the Chemical Equipment Division of General Ceramics and Steatite Corp, has formed the Allen Engineering Company at 15 Alden Street, Cranford, N J.

The new firm, specializing in chemical processing equipment, will handle the General Ceramics lines of porcelain, stoneware and plastic equipment in the New York, North Jersey and New England areas; Electro-Chemical Manufacturing and Engineering Corporation lines of acid-proof cements, brick, rubber and plastic vessel linings in Metropolitan New York and New England areas; and Falls Industries, Inc lines of impervious-graphite heat-transfer and absorption equipment. It will represent Mission Manufacturing Company for its centrifugal pumps in North Jersey, Metropolitan New York and New England areas.

Before joining the General Ceramics Company Mr Allen was with the Haveg Corporation of Newark, Delaware and E I du Pont de Nemours and Company, Inc of Wilmington.

• Kennedy Addresses "D K" Alumni

Alumni of Delta Kappa Phi Fraternity, at a recent meeting in Philadelphia, heard S J Kennedy, Research Director, Clothing and Footwear Branch, Research and Development Division, Office of the Quartermaster General, Dept of the Army, discuss textiles for the U S Army in reference to new developments in fabrics and blends, future developments needed and research being conducted.

• 38th Annual Conference, Textile Institute

Llandudno, a noted Welsh coastal resort, is to be the scene from May 25th-29th of the 38th Annual Conference of the Textile Institute, on "Structure and Purpose"; and the conference is to discuss "the structural design and testing of textile materials for specific purposes."

The conference is expected to attract textile technologists from all over the world, and immediately precedes the Coronation of Queen Elizabeth. Several prominent American scientists will give papers, among them W J Hamburger and Milton M Platt of the Fabric Research Laboratories Inc, Boston, Mass, who are to give a joint paper "Molecule to Fabric"; J B Dickson, United States Rubber Company, New York ("Functional Properties and Functional Laboratory Tests in Relation to Textile Design"), and L I Weiner, Head of the U S Army Textile Materials Engineering Laboratory, Philadelphia ("Correlation of Field and Laboratory Testing as a Basis for Predicting the Performance of Textile Fabrics").

• Helmus Outlines Competitive Problems of Synthetics

Increasing the sale and use of textiles was the subject of a recent report made to the Board of Directors of the Paterson, New Jersey, Chamber of Commerce by Weldon G Helmus, Vice-President of the Fair Lawn Finishing Co.

Mr Helmus' report, which was approved by the Paterson Chamber Board, developed several new themes regarding the competitive problems of the synthetic fiber industry and called for the combined cooperation of its segments.

• N Y Chapter, AIC, Hears Royer

The 1953 Student Award Meeting of the New York Chapter of the American Institute of Chemists, held March 26th, in the Cafeteria of Union Carbide & Carbon Corp, New York, N Y, featured George L Royer, Calco Chemical Division, American Cyanamid Co, as guest speaker. Dr Royer's topic was "The Challenge of Analytical Chemistry."

• Hatch Anniversary

May 1, 1953, marked the 27th Anniversary of Hatch Textile Research, Inc, New York, N Y, a textile testing laboratory specializing in the analyses of fabrics and tests for serviceability since 1926.

Administrative officers of the firm are Herbert H Hatch, President, and J W Sheppard, Vice President.

Eleven new members of Nopco Chemical Company's 25-Year Club pose during recent ceremonies at which they received solid gold watches for 25 years service with the Harrison, N J firm.

Standing (l to r): S Warwick, J Watts, A E Krob, C Rumble, W J Kastner, H J Turner and L J Mosch. Seated: H D McDonald, Nopco Board Chairman C P Gulick, who made the presentations; F Fischer and J J Smith. C A Larry was not present at the time picture was taken.

• American Polymer Opens Plant in Brazil

American Polymer Corporation, Peabody, Mass, has officially opened the plant of its Brazilian associated company, Polymer Produtos Quimicos do Brazil of Sao Paulo. The complete plant was designed and constructed by American Polymer in the United States and forwarded to Brazil last June through its export department, Chemicals Export Company. Polymer Produtos Quimicos do Brazil is said to be the first all-purpose polymerization plant in South America to meet the needs for resin polymers.

Building construction and equipment installation were started in July, 1952 and actual production commenced on April 6, 1953.

Dr Ryan of American Polymer has been appointed General Manager in charge of production for the Brazilian Company. Before joining APC he was on the staff of the American Research & Development Corporation, Boston, Mass.

• 4th Shawinigan Resins Expansion

Shawinigan Resins Corporation on April 3rd announced the fourth expansion in its 10-year production of vinyl resins.

Robert K Mueller, Shawinigan Resins president, reported that completion of the latest expansion would increase current capacity by 35 per cent. Shawinigan Resins is owned and operated jointly by Shawinigan Products Corporation and Monsanto Chemical Company.

Patents—

(Concluded from Page 296)

ence of acids or ammonium salts plus one of the compounds indicated above. The single bath process may be substituted using a pretreatment with these compounds, followed by the dyeing process proper or by a pretreat—with acid, followed by dyeing in the presence of the aforementioned condensates.

Example: white wool half hose is dyed at the boil in an acetic bath, containing Erional NW(Geigy), Omega Chrome Navy Blue 4 BL and Chromosol Yellow GD (Sandoz) and afterchromed. The fabric is dyed a gray shade, showing ingrain effects.

Although the amino acids immunized by this treatment are not defined, it has to be noted that only *part of the wool substance* undergoes a chemical reaction, producing interesting two-tone effects.

Reference is made to Brown's Brit P 475,422 (1937) describing a selective reaction of methylene urea-glycerine compositions on wool. This product is said to act as a wool stabilizer, linking to acid components of the wool substance, e g, aspartic acid, but not to cystine (contained mostly in the tips). No application for dyeing tippy wool is disclosed here. Condensates of phenol- or cresol-formaldehyde solubilized by sulfonic groups (bisulfite treatment) of the "Tamol" or "Setamol" type are used, according to French P 774,902 (Ciba/1934) in dyeing half wool. An almost complete resist effect is obtained on the wool protein. A similar reaction takes probably place when the current method is applied.

ecent
the

H J
who
the

one
The
tuted
com-
ocess
fol-
the

dyed
ning
rome
llow
fab-
grain

ized
has
wool
tion,
s.

it P
re-
com-
said
acid
e g,
ined
for
Con-
alde-
(bi-
or
to
eing
t ef-
n. A
vhen

953